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AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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Ferryboat "Cincinnati."

The ferryboat "Cincinnati" is the first one completed of a new type adopted by the Pennsylvania Railroad Company. These boats are especially designed with a view to increased accommodation and facilities in connection with the new elevated stations at the ferries.

The motive power of the boat consists of two steeple compound engines, of which we give a perspective view, also an end and side elevation, in Figs. 1 and 2 (page 2). These engines were designed and constructed at the P. R. R. Co. shops at Hoboken. The high-pressure cylinder of each engine is 18 inches diameter; low-pressure cylinder, 36 inches diameter; stroke, 26 inches. A distinguishing feature of these engines is the balanced piston valve, which is the invention of Mr. Hobart Canfield, master mechanic in charge of the P. R. R. repair shops at Hoboken, N. J. Fig. 3 shows this valve on a larger scale, and its action will be readily understood. One valve is used for both cylinders. When the pistons are at the upper end of the stroke, the valve occupies the position as shown in Fig. 3, allowing the steam from the lower part of the steam chest to pass through the upper port of the high-pressure cylinder as indicated by the arrows 1; while the exhaust steam from the high-pressure cylinder passes through the lower port, as indicated by the arrows 2, into the valve, which is cast hollow, and leads the steam into the upper port of the low-pressure cylinder, as indicated by arrows 3; the exhaust from the low-pressure cylinder passes through the lower port into the upper part of the chest, as indicated by arrows 4, from whence it flows through the exhaust pipes into the condenser. The advantage obtained with the use of this valve is that, during the passage of the steam from the high-pressure to the low-pressure cylinder, condensation is reduced, and a comparatively high pressure is secured in the low-pressure cylinder.

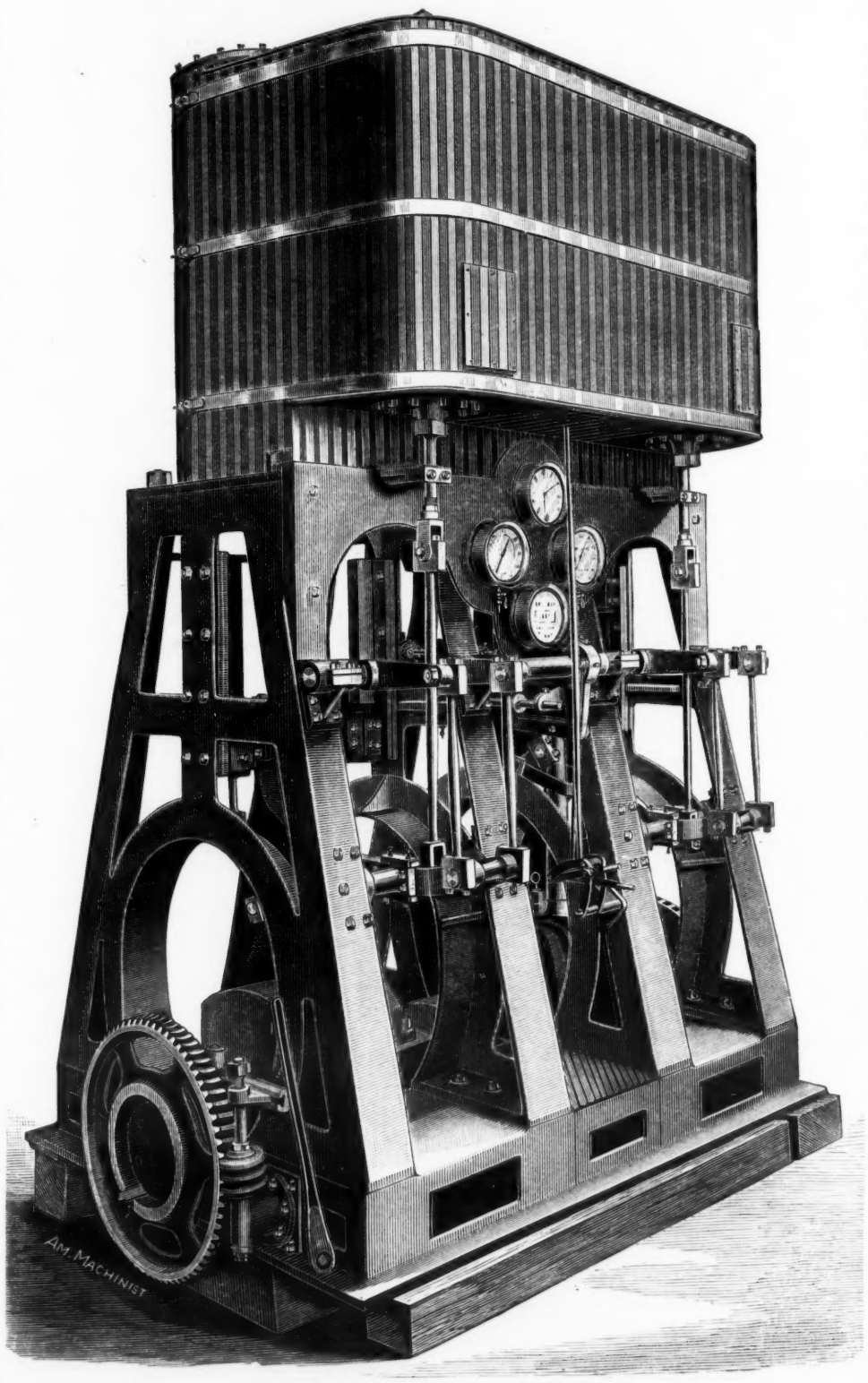
The weight of the valve, stem and tail rod is such as to counterbalance the difference in pressure on the upper and lower ends of the valve. Its construction is certainly very simple, and it gives excellent results, of which the accompanying indicator cards (page 3) give ample evidence.

In these engines the valves are actuated by a Joy valve gear, but they may be operated by any of the usual motions.

The main shafts are coupled between the two engines, so that, in case of an accident to either engine or line of shafting, they can be disconnected and used independently. The shafts extend the entire length of the boat, with a sectional propeller wheel at each end; these wheels are 8 feet 9 inches diameter, and 13 feet 6 inches pitch, and work together in either direction. The diameter of shaft is 9 inches; diameter of crank-pin, 8½ inches; length, 9½ inches. High-pressure piston rod is 4 inches diameter, and low-pressure piston rod is 3 inches diameter.

The shaft is made of iron, crank-pins and piston rods of steel.

The surface condenser is detached from the main engines; it has 1,900 square feet of cooling surface. An independent centrifugal pump is employed for the circulation of the cooling water in the condenser. The steam cylinder of the independent air-pump is 10 inches diameter; air cylinder, 12 inches diameter; both, 16 inches stroke.



ENGINES OF FERRYBOAT "CINCINNATI."

In a separate compartment adjoining the engine room are situated the heating and ventilating apparatus, an incandescent electric light plant of 200 lights capacity of sixteen candle-power each, and also one of the two Williamson steam steering engines, with which the boat is equipped. In addition to this large electric light plant there is one of thirty-five light capacity in the engine room, which is connected by a special circuit to all the signal lamps and to a number of the cabin lights, to be used in case of accident to the larger plant. This is a novel feature, which will be of great practical value in case of emergency.

Another separate compartment forms the boiler room, in which are two tubular boilers built of steel of 60,000 pounds tensile strength, with shell plates $\frac{6}{16}$ of an inch in thickness and tested to carry 120 pounds working pressure; each boiler is 10 feet in diameter, 10 feet long, and has 49 square feet of grate surface and 1,750 square feet of heating surface. There is, in addition to these, a donkey boiler 42 inches in diameter and 6 feet 9 inches in height; a circulating apparatus is fitted in connection with this boiler, by which a uniform temperature is maintained throughout the main boilers while steam is being raised. At the rear of the boilers is another compartment, in which is located the other steam steering engine and a fresh water tank.

These steam steering engines are of a type that was originally designed by the manufacturers for the Pennsylvania R. R. Co., being first placed in service on their ferryboat "Chicago," June 17th, 1886, and have been entirely successful, and satisfactory. They are placed in the hold, almost directly under the pilot houses, which gives direct connections from the steering wheels to the engines and uniform leads for the tiller ropes.

There is attached to the bell gear a specially designed indicator connected with the engine room, which shows the engineer from which pilot house the signals are given. This is arranged so that the handles connected with the indicator have to be raised before the pilot can ring the "go-ahead" bell, thereby preventing any mistakes or neglect on his part to operate the indicator.

There is also in front of the pilot a dial indicator, showing the direction in which the engines are working, so that he will always be advised whether his signals are being answered promptly. All the floors and platforms in the hold are iron, no wood being used below decks, except the insulating strips for the electric light wires, so there is absolutely no danger from fire.

The principal dimensions of the hull are as follows:

Length over guards.....	206 feet
Length of hull.....	200 feet
Beam over guards.....	65 feet
Beam of hull	46 feet
Depth from deck to keel.	17 feet
Draught	10 feet 10 inches.
Displacement	890 tons.

The hull is of iron, built by Samuel L. Moore & Sons Co., of Elizabethport, N. J., from plans and specifications furnished by the Pennsylvania Railroad Company. It has five complete transverse bulkheads, and two longitudinal bulkheads extending from collision bulkhead to collision bulkhead at either end, making in all fourteen water-tight compartments; all the deck beams are of iron, and covered with $\frac{5}{16}$-inch plates the entire length and breadth of the boat. A midship section is shown in Fig. 4 (page 3). The amidship house is also of iron, and extends nine inches above the hurricane deck, making the boat entirely fire-proof from any cause which may originate in the hold of the vessel.

The upper cabin is one spacious saloon, 87 feet long and 38 feet wide, and is on a level with the elevated stations of the road. The walls and ceilings are finished in delicate pink tints, relieved with aluminum leaf; the electric lights are placed on silvered brackets with opalescent shades around the sides, with two large iridescent electroliers opposite the landing of the stairs. The floor is handsomely carpeted. The mahogany seats

are fitted with bent wood seat-arms, secured by silvered fittings. This cabin has a seating capacity for 166 persons. The stairs to the lower cabins are inclosed with leaded glass partitions of handsome design. The two lower cabins are each 144 feet long and 15 feet wide. The adoption of the screw propeller gives an unobstructed view of the entire cabin, the handsome mahogany stairs being the grand central feature. These cabins are decorated in light pearl gray tints, with papier-maché festoons on the frieze, and roughened canvas panels relieved with aluminum leaf, producing a most harmonious effect. The floors are entirely covered with mosaic tiling, and the central domes over the stairs, leading to the upper saloon, are lighted by leaded glass.

Mahogany seats, similar in design to those in the upper saloon, afford a seating capacity for 304 persons, making a total seating capacity of 470 persons. The electric lights, which are arranged along the sides of the cabins, are of the same style and finish as those in the upper saloon, with the exception of around the stairways, where they are in clusters; the total number of lights in all the cabins is 112, making it one of the most brilliantly lighted boats in ferry service.

All the cabins are heated and ventilated by the Sturtevant system, by which the entire volume of air is renewed every five minutes. The supply of fresh air is drawn down an air duct 38 inches in diameter from above the upper deck, and passed through a heater which brings it up to the desired temperature and delivered in the cabins near the ceilings at a pressure which forces the foul air through ventilators located under the seats, which are connected by ventilating ducts with registers opening into the team gangway. The temperature is governed by electro-thermostats which control the valves that regulate the hot and cold air supply at the heater, thereby maintaining a uniform temperature.

It seems to us that, in regard to the comfort and safety of the patrons of this boat, nothing better can be desired, and the speed of the boat is equally satisfactory; with 120 pounds steam pressure, and 106 revolutions a minute, the main engines have developed, during the trials, 1,016 indicated horsepower, giving a speed of fourteen miles an hour, and the tremor due to the working of the machinery was scarcely perceptible in the upper saloon. The joiner work in all its details was built by Messrs. John E. Hoffmire & Son, from plans furnished by the architects, Messrs. Furness, Evans & Co., of Philadelphia, and embodies many new features, both in construction and ornamentation. Much credit is due to H. S. Hayward, superintendent of motive power, under whose direction this boat has been designed. Another boat of the same design, named the "Washington," is now in course of construction.

Good Advice.

General O. O. Howard has made his annual report as Commander of the East. In this report he discusses at considerable length the problem of making preparations to defend the coast of the Atlantic. General Howard's idea is that we should fortify where war is most likely to occur. He points out our defenseless condition of the country where defense is most needed, and shows what Great Britain has done. He says:

"Since the commencement of the construction of our new navy, Great Britain,

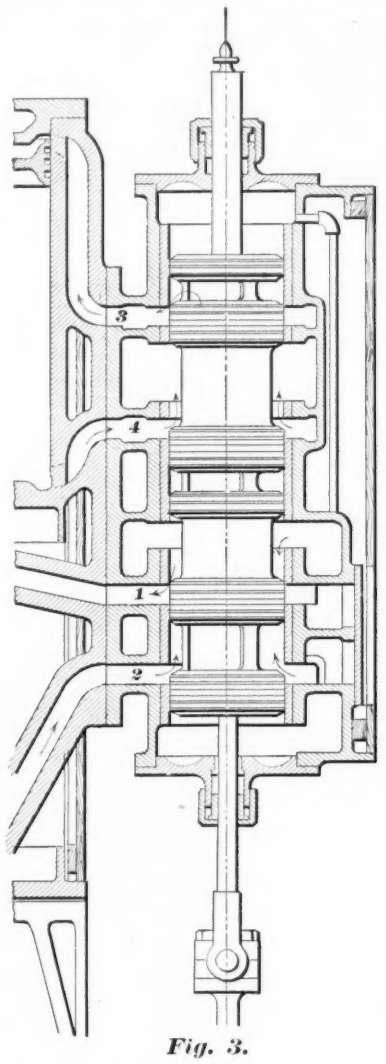


Fig. 3.

for the purpose of preserving her influence in American waters, has strengthened her fleet on our side of the Atlantic by the substitution of vessels of greater power as each change of ships on this station is made. She has now four harbors—Halifax, Bermuda, Kingston and St. Lucia—well fortified, or being strengthened, well garrisoned, or being interconnected with telegraphic cable. These are so situated along our Atlantic seaboard as to give convenient coaling stations for fleets operating in the North Atlantic, and particularly in the West Indian waters. In case of war, these fortified places will give bases from which to operate against the United States."

Further on he says:

"Besides our own protection, we have duties to humanity to perform in seeing that civilized government is maintained in certain West Indian islands; or if not, it is our duty to stand aside and give up the principles of the Monroe doctrine, and permit European powers to do what is necessary. No American desires the latter. We also have the investments of our people in countries with unstable governments to guard from injury. To do this we should be as strong in the neighboring seas as any other power, even as well prepared as England.

"To be thus strong in a military way we need not only the ships and coaling stations, but fortified harbors at convenient intervals along our entire coast. In the northern part of my department there has been provided, to be completed according to annual appropriations, such fortified points, viz., Boston, New York, and Hampton Roads. The next point to receive attention recommended by the Board of Fortifications is New Orleans, where there is to be established a dry dock and naval repair station. New Orleans, properly fortified, gives us one strong point on the Gulf of Mexico. At least one more such fortified port will eventually be necessary on the Gulf, and probably two, say Galveston and Tampa Bay.

"But on the Atlantic south of Hampton Roads we are actually defenseless. There are too many cities on this part of the coast to expect to fortify them all; but as far south as possible we should fortify a good

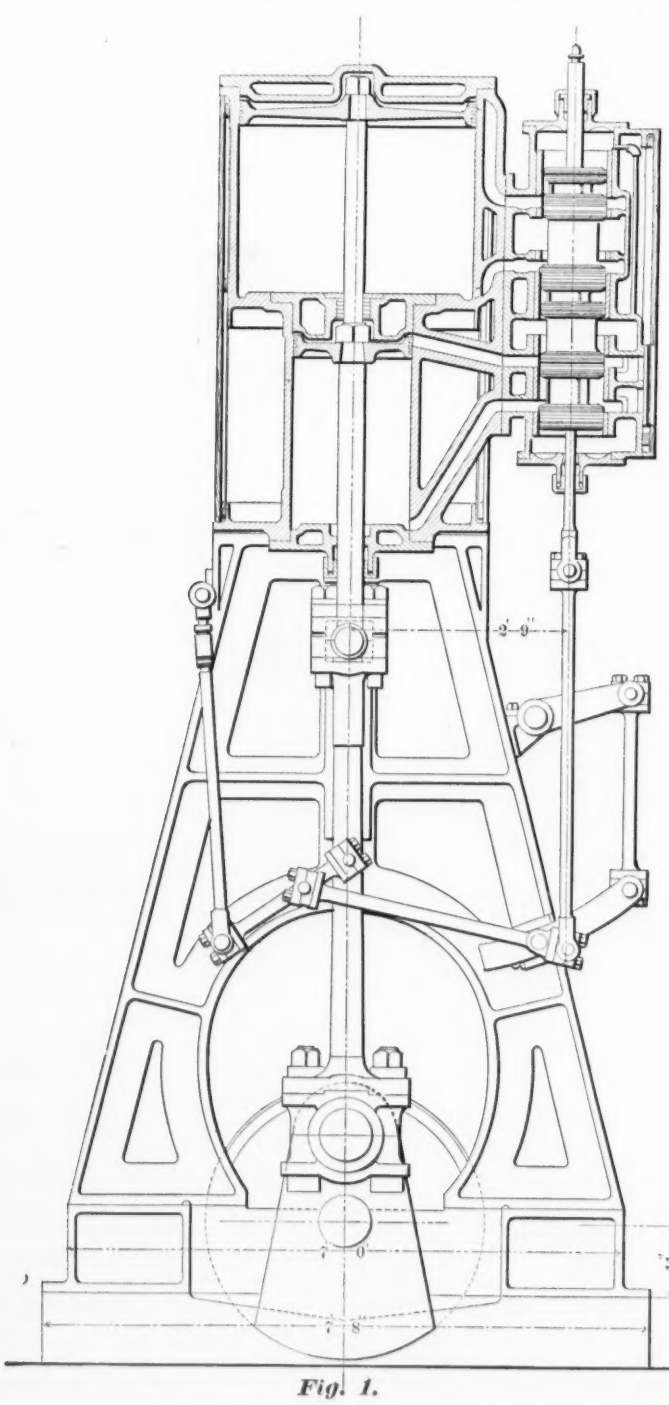


Fig. 1.

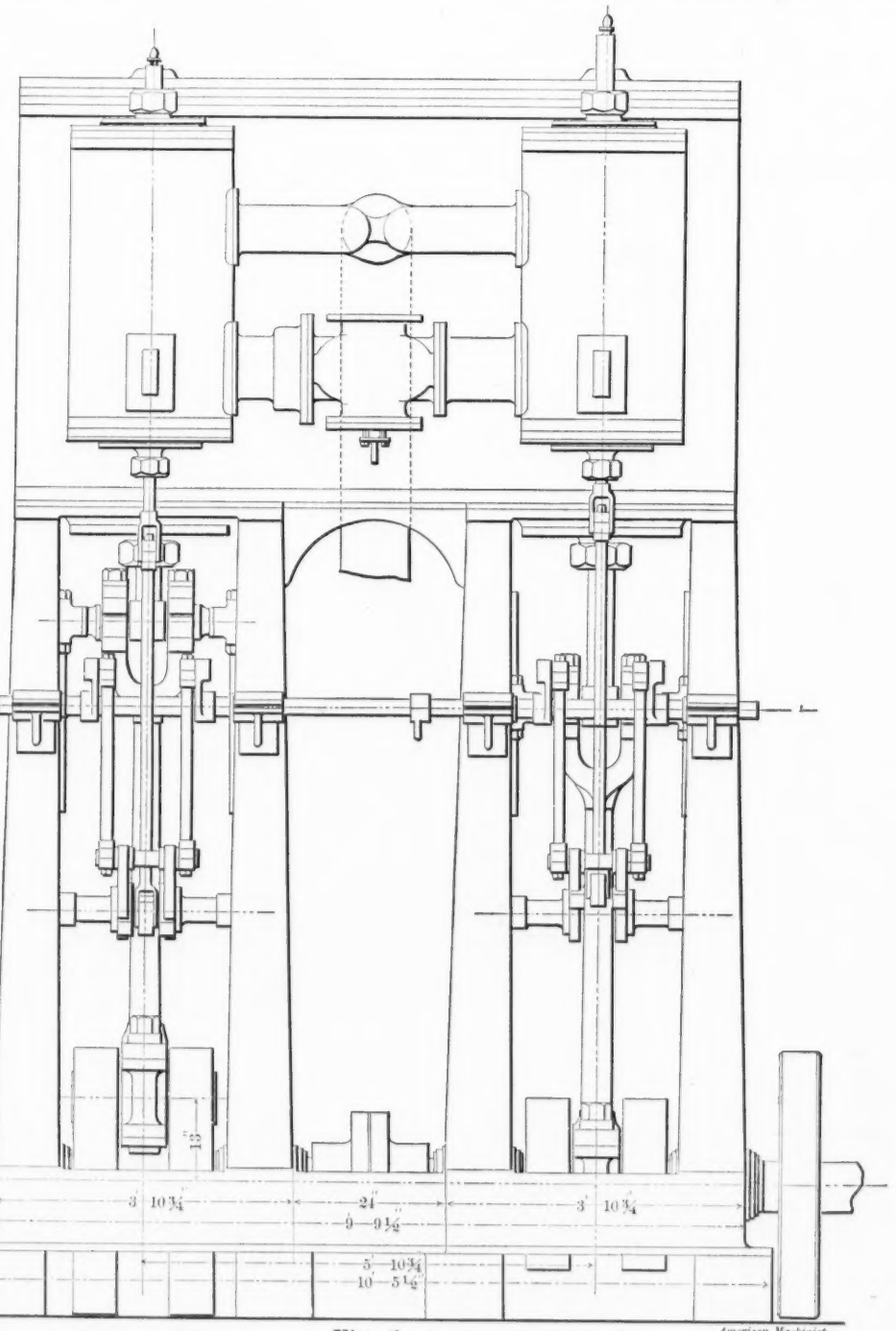


Fig. 2.

American Machinist

FERRYBOAT "CINCINNATI."—SEE PAGES 1 AND 3.

harbor, the deepest we can find, to be a refuge for commerce endangered, and to constitute a naval coaling and repair station. I recommend the complete defense of the combined harbors of Tybee Roads (Savannah) and Port Royal Sound (Broad River), by works on Tybee, Hilton Head, Parry and St. Helena Islands, with fixed torpedoes, light draught gunboats, and torpedo boats as accessories. This would at once protect the most prosperous city in our eastern quarter, and render safe the best harbor south of Hampton Roads, and furnish the naval base desired."

It seems probable that a new steamship company, to operate between New York and Brazil, will be organized. Speaking of this, the *Post* says:

"Should the proposed Brazil and New York Steamship Company be organized, about which there seems to be little doubt, it will, according to Mr. Dittenhoefer, be an applicant or bidder for some of the subsidy to be paid by the United States Government for carrying mails. It is not improbable, too, that a subsidy may also be obtained from the Brazilian Government for the company's vessels. If the promoters of the company succeed in accomplishing their object, the company will start business with a fleet of six steamships and eight sailing vessels. One of the warmest advocates of the project is A. H. De Paula Coelho, editor of the *United States of Brazil*, of this city, and he is the authority for the statement that the Brazilian Government would guarantee the interest on the $3,000,000 of capital if the company were organized, and the line between this country and ports in Brazil established."

Polishing and Grinding.

BY F. H. TREACY.

A leather or canvas strap coated with emery and running on two pulleys usually of the same diameter furnishes us with the means for polishing many things which could not be done very well, if at all, on the ordinary wheels. When a strap is used the wheels are generally so placed that the belt travels in a horizontal line; the driven pulley being adjustable to and from the driver, a proper tension can be maintained on the strap at all times. Now, although this arrangement permits of a wide and extended use of the strap, there is one class of work which requires a slightly different arrangement of parts, to the end that the operator may be enabled to use the strap to better advantage—I refer to the polishing of the inside portion of handles like (*c*) (see sketch), or like forms. Such work may, of course, be polished by means of a round stick coated with emery, and small enough to pass through the piece, the stick being revolved at a high rate of speed. This method, however, will be found slow and unsatisfactory when compared with the strap when properly handled. In the AMERICAN MACHINIST of December, 4, 1890, the writer gave a description of a polishing frame, which, with a few additions, may be used to good advantage in connection with the strap. By referring to the sketch it will be seen that the arbor upon which the small pulley (*a*) runs is fastened to a timber, through which a slot is cut in order to permit of a vertical adjustment of the pulley (*a*), which should be directly over the pulley (*b*) and in line with it. The timber itself should be firmly secured to the ceiling above, and made rigid by means of guy rods or braces. The pulley (*a*) is shown with a flange, to prevent the strap from running off against the timber. The flanged pulley (*b*) may be constructed on the same general plan as given for the emery wheels, but in addition *b* should have a flange on each side, as shown. The strap being quite loose when on (*a*) and (*b*) as shown in the dotted lines, it will not be driven by the pulley (*b*), but if we remove it from (*a*) and pass it through the handle (*c*) and onto (*a*) again, we can then tighten the strap on the pulleys (*a*) and (*b*) by simply moving the piece (*c*) down toward (*b*) until there is sufficient friction on (*b*) to cause the strap to travel around the pulley (*a*). Then by moving the piece around in different directions we are able to polish over half of the desired surface before reversing the piece (*c*). The speed in feet per minute at which the strap should travel should not be less than that used for wheels. It will be found more profitable as a rule to purchase the straps from a dealer, as they will give better satisfaction than the home-made article, unless the maker has had experience in that line. When a strap shows any sign of giving out, do not wait for it to end its career while running, for a broken strap stingeth like an adder and biteth like a serpent. As the grindstone often plays an important part in connection with the polishing business, it may be well to give some idea of the speed at which they are run in places where the users are supposed to get as much as possible out of them Mr. James Halligan, superintendent of The Lamson & Goodnow Cutlery Co., informs me that they use stones of 62" to 66" diameter, and 7" to 8" face. The Lake Huron stones are run 4,337 feet per minute, and the soft stones 3,650 feet per minute. In the case of Lake Huron stones I have often found the above figure exceeded—in a number of cases the rate was slightly over 5,000 feet per minute. It would be a difficult matter to determine the highest rate of speed at which a stone could be run with safety on account of the difference often found between stones from the same quarry, also the liability of hidden defects. A great many grinders test new stones by running them after they have been trued up at a higher speed than the normal one used, taking care, however, to keep well out of the line of fire in case the stone should decide to dissolve partnership with the arbor. If no defects, however, are shown by this test, the speed is reduced to the regular rate, and the stone put into service after being hacked. The hack somewhat resembles an adze, the blade, however, being much longer, and the handle shorter. The face should be a little more than half the width of the stone; holding the hack at a slight angle to the stone we cut around on one half of the face of the stone, then, changing the angle of the hack, finish the other half, the cuts being made about 1¼" apart. As the stone wears away this operation must be repeated as often as needed, and if it is out of true the high spots should be hacked deeper and closer. By a little practice and judgment the stone can be kept true by means of the hack alone.

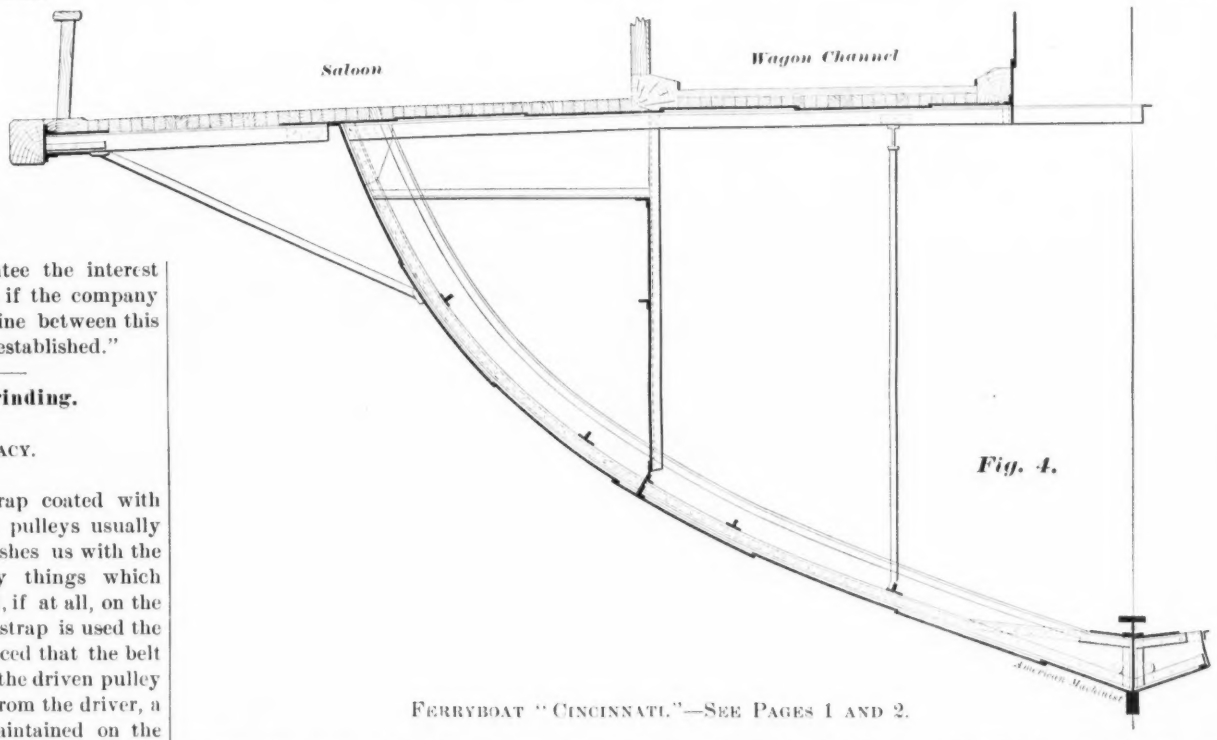
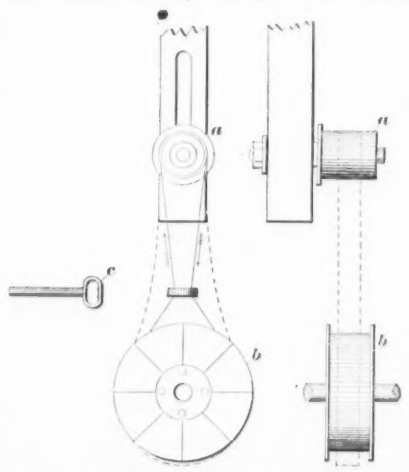


Fig. 4.

FERRYBOAT "CINCINNATI."—SEE PAGES 1 AND 2.



POLISHING AND GRINDING.

The question as to how often a stone should be hacked will be answered best by the stone itself, especially if the operator is on piece-work; for a smooth stone seems to have no cutting qualities at all scarcely in comparison with one freshly hacked.

Although our solid emery wheel friends are making rapid strides, the hacked grindstone running in the neighborhood of 5,000 feet per minute is not quite out of the race yet.

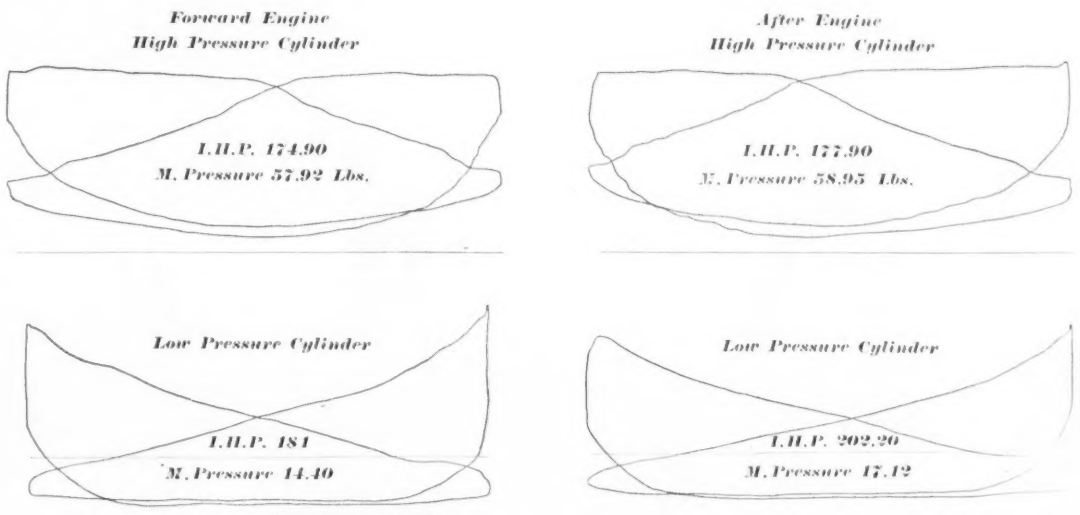


Diagram = ⅛ Size.
Scale 50 for High Pressure Cylinder.
Scale 16 for Low Pressure Cylinder of Forward Engine.
Scale 20 for Low Pressure Cylinder of After Engine.

A few weeks ago there was reported from Grand Rapids, Mich., an alleged death from contact with a trolley wire. It was asserted that a truck driver was thrown from his seat by a collision of his runaway team with a telephone pole, and that a broken telephone wire falling across the trolley twined itself about his neck and gave him a fatal shock. Were this true, it would be a very serious matter indeed, for it would show that the voltage employed on street railway circuits is dangerous to human life. Believing this latest sensational report, which was somewhat widely heralded, to be purely without substantial foundation, the western representative of *The Electrical World* was sent to Grand Rapids, with instructions to investigate and find out the exact circumstances of the accident His report in full will be found in another column. The report of the coroner's jury was that the death was produced by electricity, and the stubbornness and maliciousness of this assertion may be judged from the report of the physician who made the autopsy on the victim, that death was produced by suffocation, and there was reason enough for such a result. The unfortunate truckman was dashed to the earth, and one of his horses, crushed by the force of the collision with the telephone pole, fell upon him and lay across his chest for eight minutes, while the bystanders, panic-stricken at the sight of the telephone wire sputtering in the street near by, rendered no assistance, and let the man die from asphyxia before their very eyes. And this is the sort of accident that was charged against the "deadly trolley!" This is not the first false report that *The Electrical World* has shown up in its true colors, and we fear that it may not be the last, but in every case, so far, the result has been the same, to show that the trolley wire cannot be accused of being dangerous to human life.—*The Electrical World.*

The method prescribed for cleaning brass in United States arsenals is said to be to make a mixture of one part common nitric acid and one-half part sulphuric acid in a stone jar, having also ready a pail of fresh water, and a box of sawdust. The articles to be treated are dipped into the acid, then thrown into the water and finally rubbed with sawdust. This immediately changes them into a brilliant color. If the brass has become greasy it is first dipped into a strong solution of potash and soda in warm water; this cuts the grease, so that the acid has full power to act.

At this writing there is, in the air, a speck of trouble between this country and Chili. This trouble will, no doubt, amount to nothing, but it will call attention to the fact that a comparatively insignificant power can put in a good appearance by virtue of having heavy ironclads.

The "Buckeye" Compound Engine.

The engravings herewith represent the practice of the Buckeye Engine Company, of Salem, Ohio, in the matter of compounding their engine. This engine is too well known to engineers and steam users to require any detailed description in this connection, and the engravings are so clear as to give a plain idea of the arrangement of parts.

Fig. 1 shows a front view of the compound on a Tangye bed. Fig. 2 is a sectional plan of cylinders and valve gear, and Fig. 3 is a plan view of a four-cylinder engine, shown as a pair of tandem compounds, but which may be arranged as a triple or quadruple expansion engine.

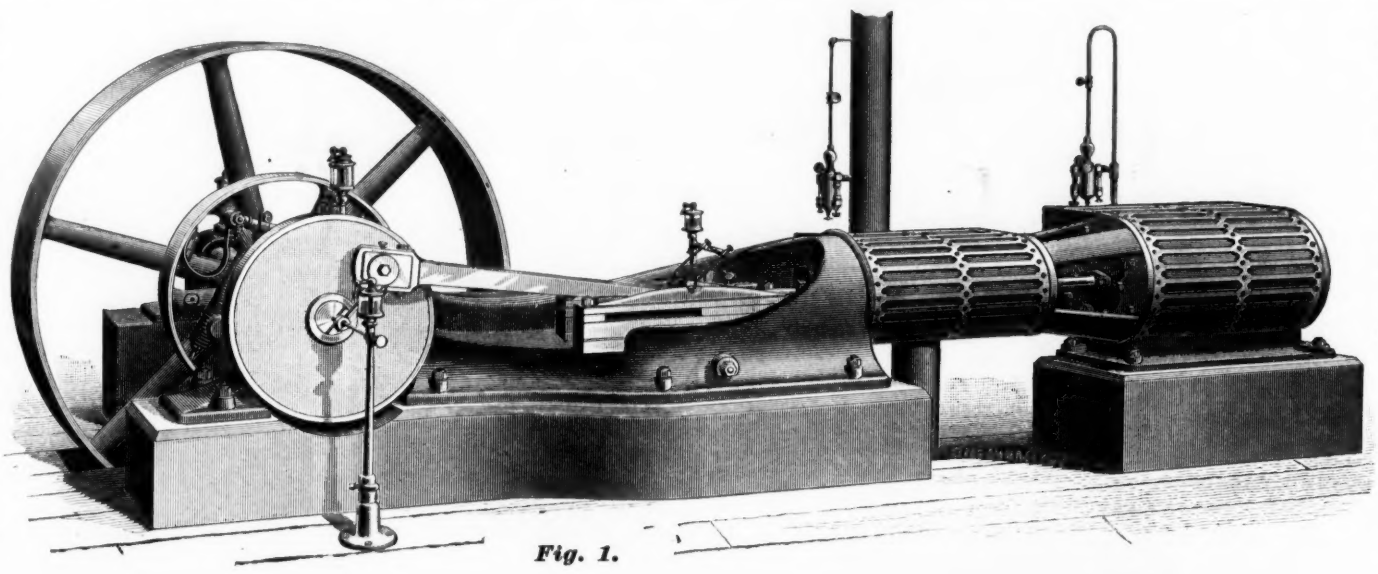


Fig. 1.

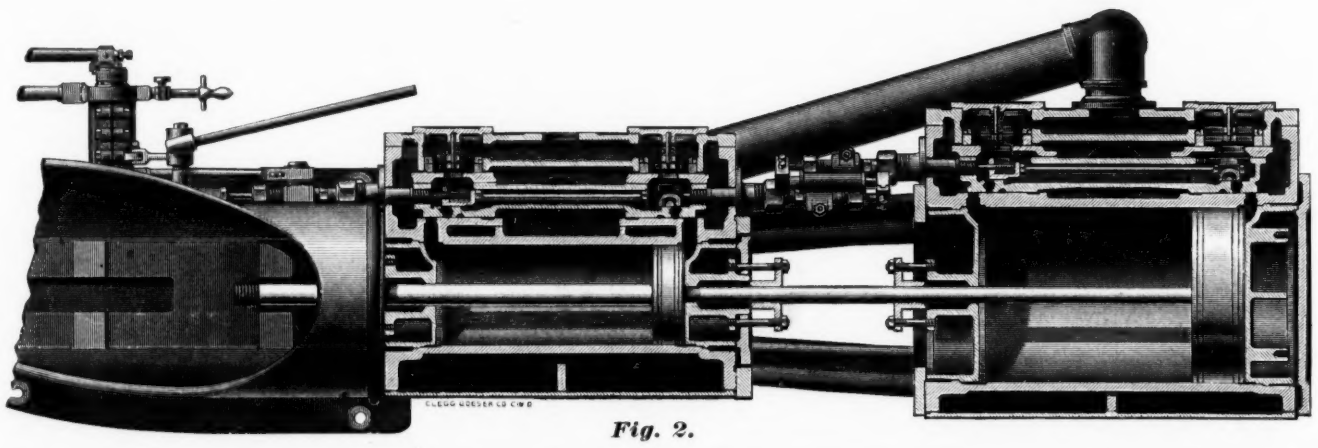


Fig. 2.

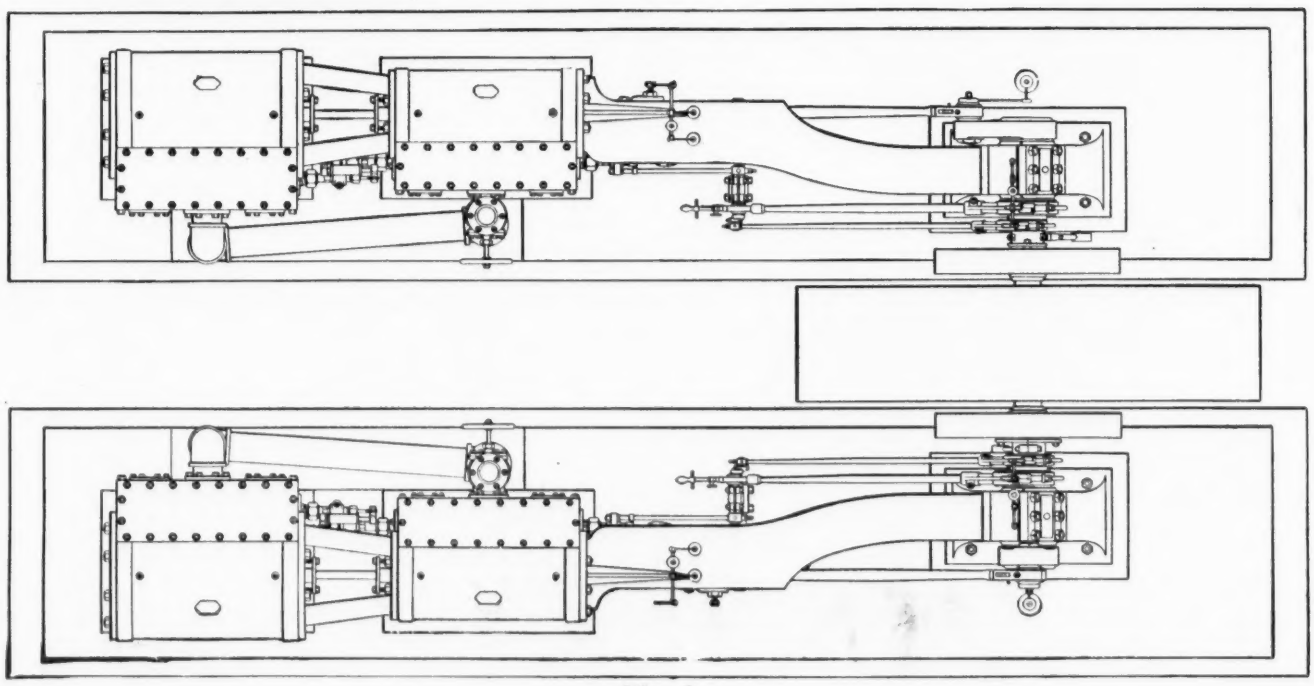


Fig. 3.

THE BUCKEYE COMPOUND ENGINE.

In regard to compounding, the catalogue of the company sets forth some facts that are worthy of consideration, from which we quote as follows:

The use of a condenser in connection with a compound engine is always recommended, wherever the water for condensation can be obtained at a reasonable cost, since the added power thus gained is obtained at a trifling expenditure of money. Its proportionately increased value to a compound engine will be apparent when we consider the relative area of piston in a low-pressure cylinder, as compared with the area of piston in a single-cylinder engine built to develop the same power under same steam pressure; for, since the pressure per square inch due to the condenser will be equal in each case, the total added power realized in the compound engine will exceed that in the other by an amount due to the difference of areas of piston.

When compound engines are to be used without a condenser, high steam pressures are very desirable; indeed, except with expert management, it is of questionable propriety to use the compound construction with steam of less than 125 pounds pressure, and higher pressures are still more desirable from an economic standpoint.

Such engines should be most carefully constructed, and the builder should be made aware of the conditions under which they are to operate, that he may proportion the cylinders, and design the working parts so that the engine may do its work safely and to best advantage. . .

The measure of saving that may be expected by the use of multiple-cylinder engines, condensing or non-condensing, over single-cylinder service, under like conditions, and assuming equally good constructions, may be roughly stated as from 10 to 40 per cent., varying with conditions, management, etc., so that, even though the first cost of the plant will of necessity be somewhat more per horse-power, this larger investment will generally be a most judicious one in view of the resulting economies. . . .

This highest economy is obtained in situations where the load of the engine being uniform (like that of a water-works pumping engine, or an ocean steamship), the design may be made to fit the situation exactly, and where the expansion may be carried to a greater extreme than can be done in an engine of moderate cost.

Uniform load, extreme ratios of expansion, great care to avoid leakage, thorough covering of pipes and cylinders to prevent radiation, and large areas of passage of steam to and from cylinders—all have great influence in fixing the possible economy of the engine; but to gain the best results, expert management of both engines and boilers must be added.

It has recently, in this country, become the fashion to raise the American flag over schoolhouses. Out in Clark township, Indiana, this was recently done, but the next morning it was found that the flag had been torn down. There was some difference in opinion in the assembled crowd the next morning as to whether another flag should replace the one destroyed. The teacher, a young girl, appeared on the scene about this time, and settled the whole matter by announcing that the flag should go up, if she had to do the whole business. It is almost needless to say that she won by a good round majority, which was creditable to her audience.

An Ingenious Contrivance.

To instantly obtain a light sufficient to read the time by a watch or clock at night, without danger of setting things on fire, is an easy matter. Take an oblong vial of the clearest of glass, put into it a piece of phosphorus about the size of a pea, upon this pour some pure olive oil heated to the boiling point; the bottle to be filled about one-third full; then cork tightly. To use the light, remove the cork, allow the air to enter, and then recork. The whole empty space in the bottle will then become luminous, and the light obtained will be a good one. As soon as the light becomes dim its power can be increased by opening the bottle and allowing a fresh supply of air to enter. In very cold weather, it is sometimes necessary to heat the vial between the hands to increase the fluidity of the oil, and one bottle will last a winter. This ingenious contrivance may be carried in the pocket, and is used by watchmen of Paris in all magazines where explosive or inflammable materials are stored.

A press report says that Mr. Eugene Winchet, of Detroit, who owns a street railroad there, has ordered that all workmen carrying dinner pails be carried free. If this is true, it shows a very good spirit upon the part of Mr. Winchet, but still we seriously doubt if any such special privileges granted to workingmen, as such, do them the least good in the end, but, on the contrary, we think the ultimate effect will be the reverse of beneficial to them. It is far better to have it understood that American workingmen are expected to, and do pay their way, the same as other citizens, and that their wages must be based upon this fact.

If, as is reported, Thomas A. Edison has devised a practical plan for propelling street cars without the use of the dangerous overhead wires, he should be blessed. Another invention of Mr. Edison is said to be the application of electricity on railroad lines through which a speed of 100 miles an hour is to be attained. This—a speed of 100 miles an hour—is a rather old story, on paper, and will require considerable consideration outside motive power.

Some one with a statistical turn of mind has tried to estimate the saving in machine construction by the advent of the solid emery wheel. He puts the saving at ten per cent. or thereabouts.

There is a gratifying evidence of increased activity in the machine trade.

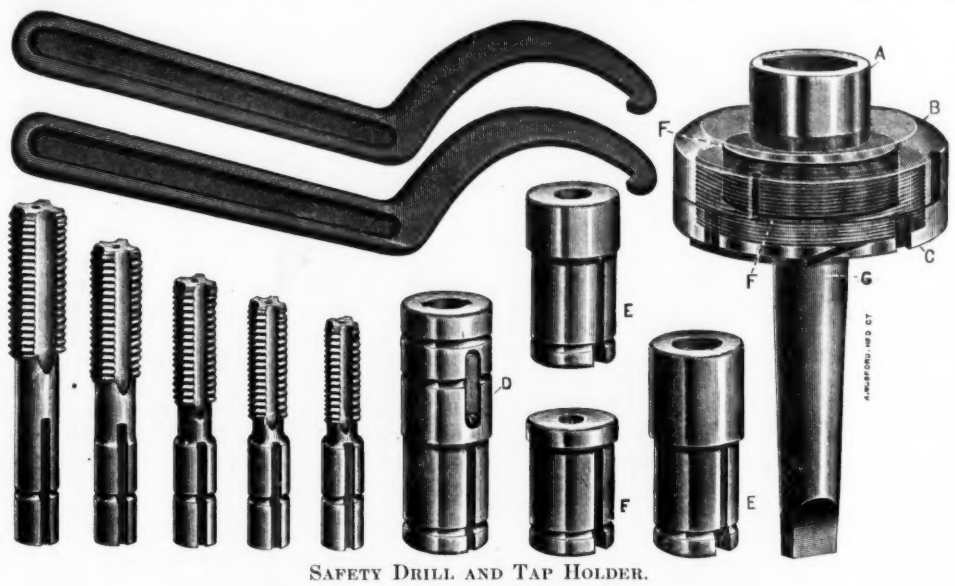
Safety Drill and Tap Holder.

Of all the labor performed in the machine shop, that of tapping is one of the most laborious. And although tapping machines have been in use for some time, yet they are generally neither designed nor intended for general work, and it is a singular fact that it is only very recently that any attempt has been made to do the work by any other method than that used fifty years ago. Of late, several devices have been made for the purpose, intended for use in the upright drill, and doing the work by power, thereby effecting a great saving in time, as well as doing the work more accurately than was formerly the case.

The safety drill and tap holder herewith illustrated is made by Beaman & Smith, Providence, R. I.

In construction, the holder is very simple. There is nothing to break or get out of order, and no complicated parts, and its operation is easily understood. If properly used, it is impossible to break either drill or tap, and the change from one to the other can be made instantly, and without stopping the machine.

The holder consists of a body *G* screw threaded upon the outside, and recessed to receive the friction socket *A*, with the taper shank fitted to the spindle of drill or lathe. The friction socket *A* receives the drill socket *E* and the tap sockets *D*, and it is held between two pieces of vulcanite fiber *F*, and driven by the friction obtained by tightening the friction cap *B*, so that the friction produced will be sufficient to drive the drill or tap, but will slip so soon as the tap bottoms. Then by reversing the motion of the driving spindle, the tap is withdrawn. The tap socket and tap being driven by feathers, prevents all danger of stripping the thread. Special taps, as shown, are recommended, but special tap sockets can be furnished to take the usual square shank hand taps.



SAFETY DRILL AND TAP HOLDER.

A New Vertical Milling Machine.

On this page we present an engraving of a new milling machine, intended especially for general machine shop use, and to do a large variety of work now done on planers or shapers, and to do it better and much faster where the work is of such a nature as to adapt it to the milling operation.

As will be perceived, the machine consists essentially of a substantial base upon which is mounted a platen capable of moving in any direction under the spindle, which is vertical, driven in the manner shown, and has a vertical movement to adjust it to the cut.

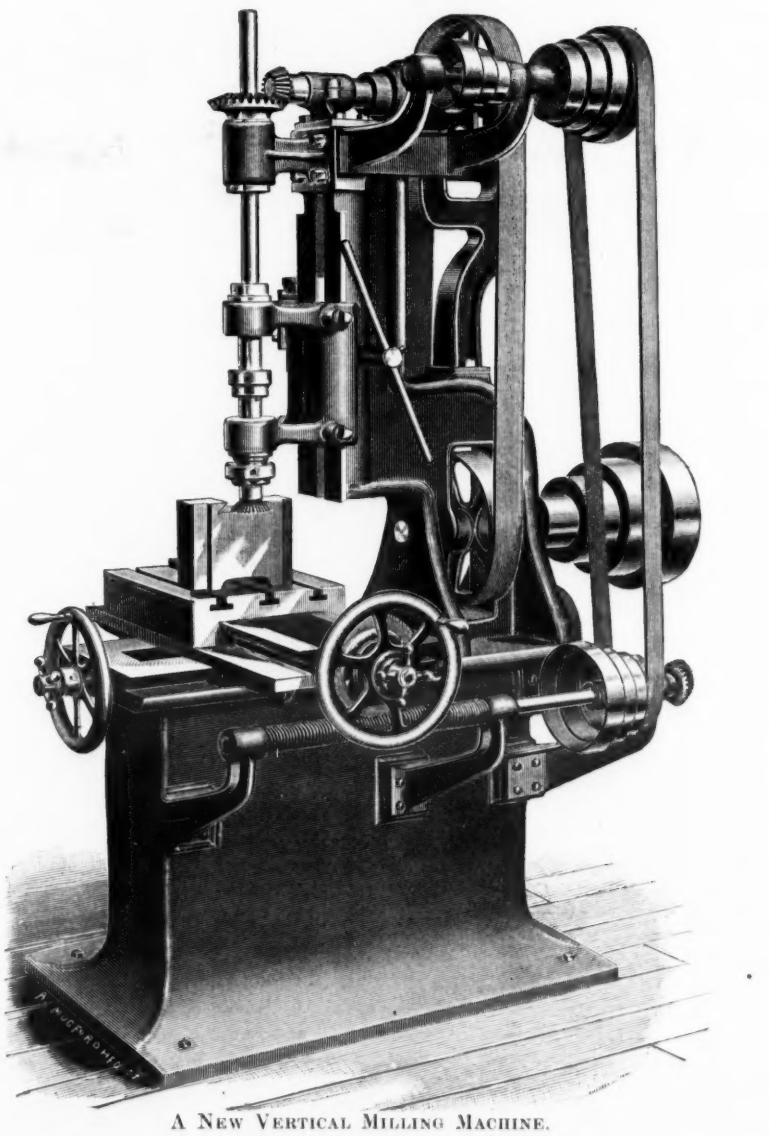
The platen, which is made heavy and has three T slots milled through it from the solid, has a movement in and out of 15″, and from side to side of 19″. Its entire upper surface can at any time be milled off by the cutter, thus insuring true and accurate work so far as can be done by an accurate platen.

The head which carries the spindle bearings is gibbed to the vertical slide, and split, so that, by tightening the two bolts shown at the side of the head, it is made practically solid. There is a sliding micrometer, by which movements of this slide are indicated in thousandths of an inch, so that, in moving the cutter from one surface to another of different height, there is no necessity for the use of scales or other measuring tools, as the exact depth can be obtained by the use of the micrometer.

The cutter spindle is of steel, large enough for the heaviest work, runs in bronze bearings, and is threaded at the end for the reception of large face cutters, this thread being covered, when face cutters are not in use, by a nut which not only protects the thread from injury, but also serves to draw the arbor or shank cutter into the spindle, and hold it there firmly, thus preventing all danger of its becoming loosened while in a cut, and also doing away with the necessity for pounding upon it to drive it into the spindle. The cutter or arbor can as readily be removed from the spindle by turning the threaded collar shown between the two main spindle bearings.

There are eight changes of speed for the spindle, and the driving power is sufficient to enable a surface 6″ wide to be milled, or to mill one side of a 45° dovetail 1¼″ deep. The depth of the cut on the piece of work shown on the platen is 1¼″, and it has been demonstrated that work of this character can be done on such a machine in about one-third the time required to do it on a planer or shaper.

There are also eight changes of the rate of feed as shown, which allow of the best rate being selected for any cut or diameter of cutter.



A NEW VERTICAL MILLING MACHINE.

An ordinary planer chuck can be bolted to the platen, and any work done which can be held in that manner.

The derivation of the feed motion is easily perceived from the cut, the long worm being used to give motion to the worm-wheel in any position of the platen. The motion of the lower slide is derived from a worm-wheel at the back of the machine, which is driven by a worm on a shaft which is driven by the bevel gears shown at the right of the lower feed cone pulley. Both feed screws are covered, to protect them from dirt and chips, and that for the transverse movement is graduated to indicate thousandths of an inch. The machine is capable of milling work 12″ high, 14″ wide and 19″ long. It was designed by Mr. F. B. Manville, originally for use in the machine shop of Blake & Johnson, Waterbury, Conn., of which Mr. Manville is superintendent, and is now being built for other shops by the above-mentioned firm.

The Typical Railroad Official.

The reporter that had accompanied the special train to the scene of the wreck hurried down the embankment and found a man who had one arm in a sling, a bandage over one eye, his front teeth gone, and his nose knocked four points to starboard, sitting on a broken truck of the sleeping car, and surveying the horrible ruin all about him.

"Can you give me some particulars of this accident?" he asked, taking out his note-book.

"I haven't heard of any accident, young man," replied the disfigured party, stiffly.

He was one of the officers of the road.—*Chicago Tribune.*

LETTERS FROM PRACTICAL MEN.

Mechanical Drawing.

Editor American Machinist:

An instructor of drawing in a western manual training school, while exhibiting some drawings, informed the visitors that it was the mechanical drawing done by the pupils during their course, and covering about a year's work. There were six or seven sheets, about twelve by eighteen inches in size, to each pupil, having geometrical plane and solid figures upon all but one, which was in nearly every case a neat drawing of a poorly designed connecting rod. The subject of one of these finishing drawings of the pupils' work was a pedestal bearing, having, neatly shaded, the name "Journal" underneath it.

In other cases, catalogues and instructors have indicated that drawing in which compass, square and triangle are used as mechanical drawing, including architectural and machine designing as departments of it.

In the little book written by Professor Linus Faunce, entitled, "Mechanical Drawing," one-fifth of its pages are devoted to "Use of instruments, inks," etc.; nearly all of the remaining four-fifths to constructive and descriptive geometry, and but six pages to "working drawings." The question arises, What is mechanical drawing? While it is true that all names are arbitrarily chosen, and a chair might be called anything, for instance, a mastodon, if it were so agreed, there is such a thing as scientific naming, making it important that certain names should be used; and, following this science, it seems but reasonable that teachers should be responsible, to a great degree, for the meaning of words that aid or hinder useful discussion.

If such drawing as spoken of is called mechanical because instruments are used, what drawing is not "mechanical"? for if a pen is an instrument, are not all pens and pencils instruments? Or if some instrument guides the pen, why should it not be distinguished as *instrumental* drawing, rather than mechanical? Instrumental music seems to be a parallel case; how absurdly "mechanical music" would sound, unless it were music produced automatically, in which case the analogy to drawing would not hold, as we have no automatic drawing machine. Practical men generally use "mechanical," "architectural," etc., to distinguish drawings of corresponding objects, whether they be in simple projection, isometric, or perspective. Are the schools wrong, or does this usage exist only in the less practical schools? It may be a small question, but it is as great as whether the rim of a pulley is a felloe of the wheel, in the use of which name an engineer might be laughed to scorn.

M. E.

That "Phenomenon of Shrinkage."

Editor American Machinist:

I like to see these practical questions that come up in the AMERICAN MACHINIST, especially those that arise when anybody gets into trouble of some sort, because then there is a chance of somebody learning something. I like to see the answers follow the questions within a reasonable time, and in liberal variety. Some time ago I asked for some information as to the use of the diamond for truing up emery wheels. My question elicited only a single answer, but that answer was an excellent one, and I was able to use it to great advantage as authority in reforming some shop practices.

I have been wondering why some one has not before this had something to say about the "phenomenon of shrinkage" that Mr. Samuel T. Williams told us about, Sept. 24. I have seen various phenomena in connection with shrinkage fits, and doubtless every one with much experience in that line has

had his share of such phenomena. I remember Charley, who put the piston over the blacksmith's fire, and was in too much of a hurry, and burnt a hole out of one corner of it before the hole in the middle of it, or, rather, the metal around the hole had got hot enough, and he had to go to the foreman with his version of the phenomenon. "She burnt off before she got hot," he said, and we had it for a by-word for years.

Mr. Williams was in too much of a hurry in heating his piston. He evidently heated the piston at the center more than at the periphery, and he also heated one side more than the other. The moral is that the whole piece to be heated should be heated as uniformly as possible. It does not seem to be quite satisfactory that the whole piece should be at a uniform heat when the heating is completed. The heat should be kept as uniform as possible through the whole mass during the whole process of heating. It is quite common and easy to put a piston over the fire, and let the blast up through the hole, and to overheat the metal around the hole, with the consequent "phenomenon" that, as it can find no room for expansion outwardly, the expanding metal can only make room for itself by crushing inwardly, and reducing the size of the hole. It is much better to heat the piece in an oven, or to build a wood fire over it and heat it "all at once, and nothing first."

Mr. Williams probably cooled the piston as he heated it. He probably cooled it first where it could be cooled most readily. The water naturally poured into the hole and cooled around it first, and the metal remained permanently as compressed, and the hole was consequently evermore smaller. I narrated in the AMERICAN MACHINIST years ago—and got sat down upon for it—a case similar, but very different. I took a piece of steel from 12″ to 18″ long, or, rather, several pieces, a lot of reamers, and from 1½″ to 2″ in diameter. I measured their length carefully when cold, then heated them up to a hardening heat, and hardened them by cooling as quickly as possible in water. Upon measuring them again I found them all longer than they were originally. All who hold, as I do, to the theory that steel becomes smaller in hardening, said that what I told could not be so, yet I have not found to this day any account of any one else trying it upon pieces of similar size. I offered no theory or explanation in connection with the matter, but it would not have been difficult to find one. When the outside was cooled, it could not shrink and go back where it belonged, because the heated center kept it distended, and when the center cooled, it could not then drag the outside back to its original length, because it had become too hard and unyielding, and the piece of steel was finally left in a state of unnatural strife, the interior pulling with all its might, and the outside resisting under an enormous compression strain. Pieces of steel under these conditions often refuse to submit to the treatment, and drop right in two.

It is not probable that, as Mr. Williams suggests, there was a "tension" left in the casting, as it originally cooled sufficient to account for the phenomenon encountered. Unequal and hasty heating and cooling seems to be sufficient to account for it all.

FRANK RICHARDS.

Elevating the Molder and Molding.

Editor American Machinist:

Mr. Shaffer, in your issue of Oct. 29, reviews or criticises passages in the "American Foundry Practice" and "Molder's Textbook," and says he fails to see how I can reconcile that on page 8 of the former with page 30 of the latter.

If he will take into consideration that the passage, "A shop that makes a specialty of two or three different kinds of castings is no place to learn the molder's trade," is printed in an article entitled "Learning the Molder's Trade," and that, "If foundries keep on dropping out of jobbing and taking up specialties as they are now doing, molding must be advanced," is printed in an article entitled "Perfection in Molding," I think he will obtain a clearer idea of the principle. I desired to illustrate and see that they do not conflict with each other as he first thought.

I still claim that specialties will advance the science and perfection of molding, and also that the jobbing shop is the best place to make or start the molder.

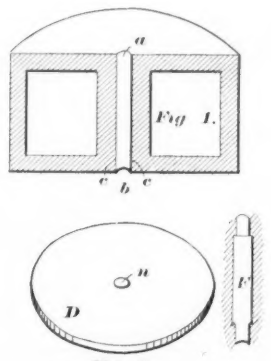


Fig. 2

PHENOMENON IN SHRINKAGE.

If Mr. Shaffer will also notice the distinction between the terms "molder" and "molding," as applied in the articles referred to, he will be still better able to see the practicability of reconciling the one statement with the other. THOS D. WEST.

A Peculiar Job of Planing.

Editor American Machinist:

Jim T. was an old-time machinist, and about the most ingenious one I have ever met.

I have been told of quite a number of peculiar schemes that he originated in order to do a piece of work, without what most people would call proper rigging for it. From among them I show with this a way by which he faced off a large disk, a disk too large for any lathe within his reach, and too large, most people would say, for his planer; but Jim did not think so. Jim was employed at this time in a saw works, to do repair work.

There was not repair work enough to keep him busy all the time, but it was necessary that he should be there all the time just the same, so of course he could spend his time at work by methods that would not pay a regular machine shop.

The works required a large disk to hammer saws upon—I think six feet in diameter. It needed to be faced off true, and there was not a good lathe for the purpose in that part of the country at that time.

Jim said he could do the job, and so the casting was brought to him. For machine tools, Jim had a 16″ lathe, a small drill press, a grindstone, and a small planer—I think one that was made to plane 24″x24″ and four feet long, but Jim made it plane this 6-foot disk just the same. He bored the central hole with two pieces of plank, two old shaft boxes, an old piece of shafting for a boring bar, a screw for feed, and ingenuity for the rest.

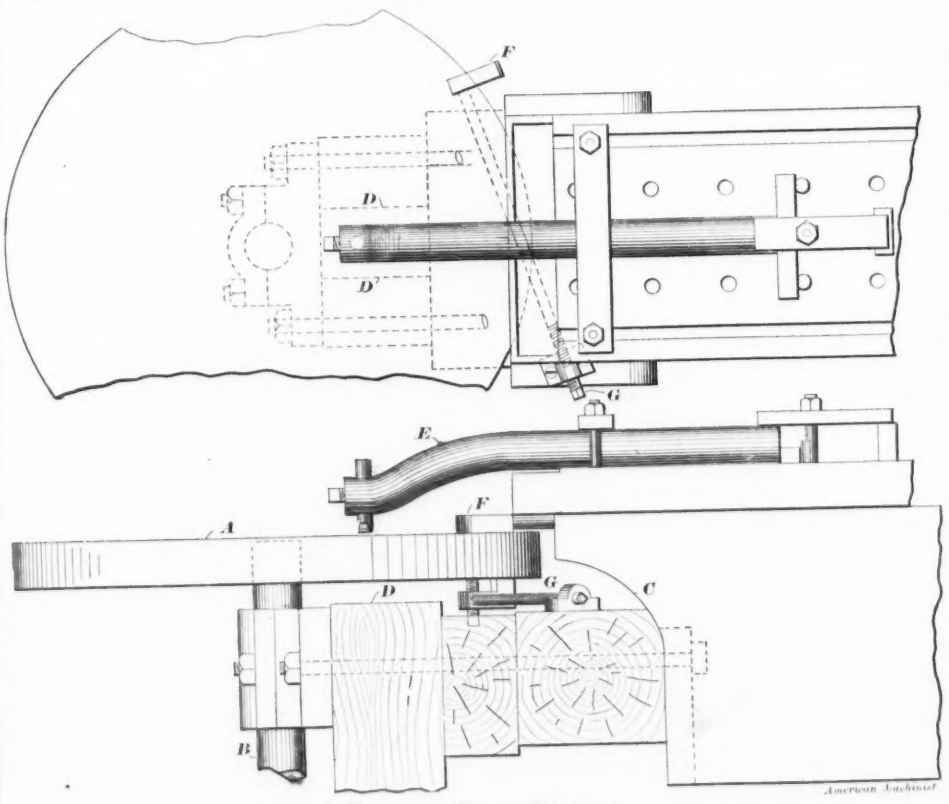
For the way by which he faced off the disk I refer you to the drawing with this.

The disk *A* was mounted upon the shaft *B*, and then the whole bolted to the back of the planer bed, as shown. The lower box was attached to the timbers *D D*, the same as the upper one, except that the lower ends of these timbers were bolted to a block, which was fast to the floor, with a wedge between, which he used to help him get the disk true with the line of the platen's travel. With the bar *E* it can be seen how the disk was planed to the center all around.

For the feed I think he used a gripe, as shown at *F*, and screw *G*. He could feed about four or five inches, and then move the gripe along and commence again.

When he had roughed it out all around, he bolted a long lever to the back side of disk, and got hold of the outer end, and so could feed more than half way around without readjusting the lever. I was told that he made a good job of this.

A MECHANIC.



A PECULIAR JOB OF PLANING.

Phenomenon in Shrinkage.

Editor American Machinist:

In your issue of Sept. 24th I see an account of what is called "A Phenomenon in Shrinkage," in which Mr. Samuel T. Williams relates an experience in regard to heating pistons, to the effect that the lower side of the hole at *B* was $\frac{1}{32}''$ smaller than the reamer that bored it out. On first thought, this could be termed a mystery or phenomenon, as it was correctly called, the solution of which is comparatively easy, when certain well-known facts connected with shrinkage in such castings are considered.

In the first place, while Mr. Williams' theory in regard to the difference in size of the hole would apply to the general shape of the casting, it could not be applied to the hole in question, for the simple reason that any stress from unequal cooling, or produced by the core, would not create a tension on the center sufficient to allow it to be compressed to the extent mentioned. In fact, from the proportions of the casting given, there could be no tension on the center, because it is the last part of the casting that cools. Were the conditions reversed, *i. e.*, the center cooled first, there would be a tension on the center, from the fact that the outside cooling last produces a strain on the center. It will be evident now that the solution of this phenomenon cannot be found in this direction, so we will look in another, adhering at the same time to what has been proved from experience to be the laws of expansion and contraction governing such cases. In short, to know the cause of the phenomenon mentioned, it will be necessary to produce like results at will.

To me it seems to be, not a question of stress or strains from unequal cooling, but of stress or strains from unequal heating. The question is then, How was this piston heated? Was it in a muffle furnace, or one constructed on that principle, in which the piston would be heated equally from every point? Or was it in the blacksmith's forge? With the use of the latter, the difficulty mentioned has occurred in every case, and this is just the way that nine out of ten machinists heat a piston.

One or other of the plane sides of the piston is placed on the fire, not with a view to heat the piston uniformly throughout, but with a view to heat the center hole, without the least thought of the effect of heating a circular or any casting in the center first. The result is that the plate or side which is next to the fire heats at the lightest part first, *i. e.*, the corners shown by the dotted lines *c c*, Fig. 1. The consequence of which is that the part heated is unable to expand from the center, as it naturally tries to do, and is forced to expand, swell, or apparently contract toward the center, because, on account of the comparatively cold metal immediately around it, it cannot expand any other way. Now, on being cooled it cannot resume its original shape, because the parts heated being exposed to the cooling influence first, do not get the chance to shrink back to their original place, on account of the exposed parts cooling first, leaving them in very near their dimensions when heated, and consequently with a diminished size in the hole. Now as we have used theory so far, we will have to know the practical cause to produce a like effect, and to illustrate more fully we will take the plate *D*, supposing it to represent the lower plate of piston at *B*'s side.

On applying a blow flame, or other means of heat, from the under side of hole *n*, long enough to heat it to or above a red heat, what would be the result? The only result would be this, that the corners of the metal shown at *c c*, Fig. 1, would get hot first, and, as it cannot expand from the center, it has to expand toward the center, or swell both toward the center and immediately around the hole, producing a corresponding diminishment in the size of the hole, and an increase in thickness of plate at the hole, which, as I said before, does not resume its original dimensions on being cooled.

How then, may I ask, can anything else be expected when the center of a casting is heated first? Should heat be applied to the hole *a b*, Fig. 1, heating it uniformly throughout, the metal around the hole will expand, as expected, between the top and bottom plates, and swell toward the center of the plates, and produce a hole as shown at *F*, or, in other words, it would expand naturally from the center, when there is room for such expansion.

Now, the cause of the phenomenon experienced by Mr. Williams could happen in only one way, and that is, the side of the piston in which the decrease in the size of the hole occurred was placed down, receiving the heat, as has been stated.

Much credit is, I think, due Mr. Williams for drawing attention to this apparent phenomenon. For, although not a machinist, I can recall a number of instances in which I have noticed the corners immediately around the hole broke out from driving the rod through. Although the above may not be the correct solution of the mystery, I at least think it is feasible, as a trial will prove. ALEX. CAIRNS.

Highlands, Col.

An Interesting Experiment with Steel.

Editor American Machinist:

It appears that the idea that steel is a chemical combination of iron and carbon is universal; but where is the proof? When two elements combine chemically the nature of both changes; this does not happen when iron is carbonized, but a change does take place; the pulverent carbon melts. Well, it will be said carbon has never been melted. Be pleased to hear my explanation. The atoms of carbon buried in molten iron are in a very different position, for instance, from that of electric light carbons; it does appear that the fact that the iron is molten has a greater effect on the carbon than the temperature itself. To this action we have a parallel in ordinary illuminating gas, concerning which a prominent work on chemistry says: "The light and gaseous hydrogen possesses in a great degree the power of rendering other bodies aeriform, on uniting with them, even those which are not volatile, just as an eloquent speaker can communicate his enthusiasm to an indifferent audience."

To prove this idea I have succeeded in crystallizing carbon taken from steel wire nails, iron cut nails, and steel filings, by dissolving them in acids. It is, however, a difficult thing to do, the chief obstacle being that about 98 per cent. of iron must be dissolved in order to obtain about 2 per cent. of carbon. If the dissolution of the iron is violent, the gases generated carry the nascent carbon to the surface, where it is oxidized by the oxygen in the air, causing small explosions that are easily perceived in sunlight; to this nascent state of the carbon its power to crystallize is due. If the action is less violent, or the carbon artificially obstructed, that which is so obtained resembles lampblack; sometimes a body of the same consistency is formed, but it is white.

My first experiment was to dissolve a small quantity of steel filings in about a teaspoonful of acid, which resulted in a few small crystals, but nevertheless larger than the grains of steel; by pressing these crystals into my thumb nail and drawing them across glass, they cut or scratched as only diamonds can. The result of the past six months of experimenting is small, but sufficient, I think, to establish my theory.

It may be mentioned here, in support of this argument, that diamonds, on being placed in the electric arc, melt, oxidize and disappear like a flash; carbon in steel, on being burnt, behaves in the same manner, which would indicate not alone the separate existence of carbon, but that it is molten.

It appears to me as reasonable, that, when steel is heated, the atoms of carbon have a tendency to unite, and form comparatively large particles; when slowly cooled these particles remain large, but on being chilled the molten particles are shattered to atoms; in this way the surface area of diamond presented to iron may easily be increased from ten to one hundred times. With this increased surface, contact, and the more thorough diffusion, it is not difficult to understand why steel should harden on being chilled. It is also possible that the different conductivity of carbon and iron, and electric currents set up in the chilling metal, have their influence on the arrangement of the atoms, and possibly on the degree of hardness or tenacity; by drawing temper the atomic diamonds begin to gather and rearrange slowly, until the proper degree of hardness or size and arrangement of diamond particles is shown by the color, when further progress is arrested by quenching.

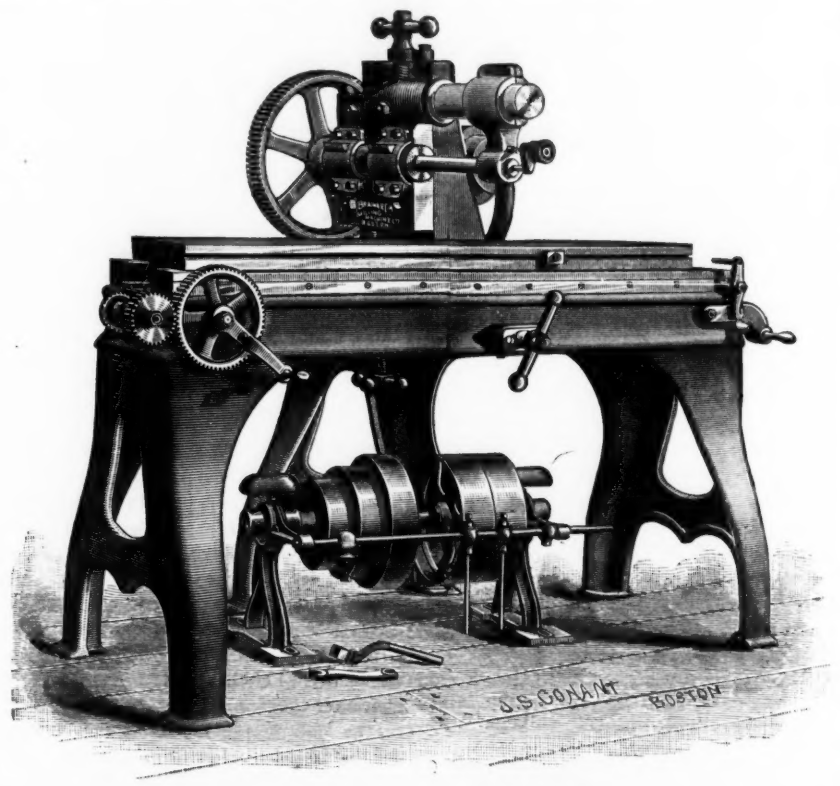
CHARLES WETTERER.
809 Columbus Ave.,
New York City.

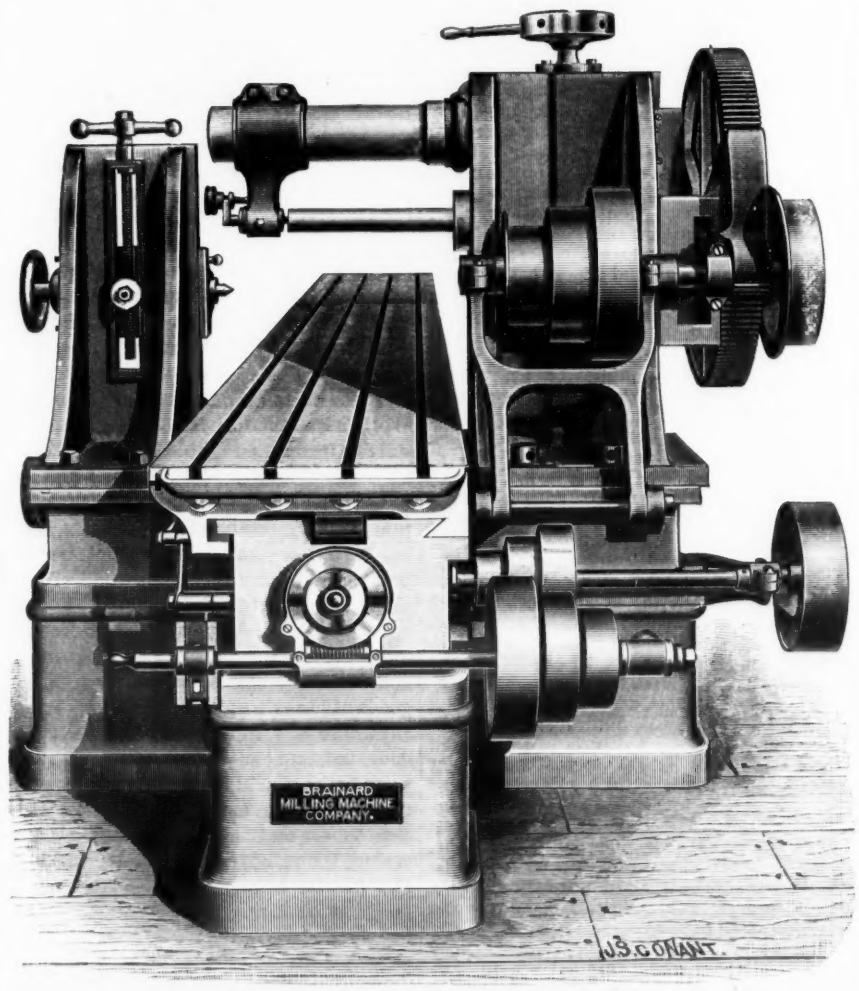
Mr. Tilden, with all his legal astuteness, was not able to make a will that would stand the test of the law. But his grandniece is, so it appears, determined to carry out the intentions of Mr. Tilden, in so far as the establishment of a great library for New York is concerned. Mrs. Hazard's endeavor to carry out the will of the testator ought to be appreciated.

Long Feed Milling Machines.

We give on this page illustrations of milling machines which are typical of a complete line of machines made for similar work, and extending from 50-inch to 96 inch machines, this designation being derived from the length of continuous cut taken, the width, height, and other dimensions being of course proportional to this.

The first illustration is of the 50-inch machine, which is adapted for any plain work, especially key-seating or splining, its capacity being to cut a key-seat one inch wide and one-half inch deep at one operation, with a feed of 30" per hour; or it will cut 2, 3, or 4 smaller key-seats simultaneously. The cutters can be sunk into a shaft or other work at any point of its length. It has a cross adjustment in line with the spindle. This machine has been made with a platen up to 12 feet in length, and with an automatic feed of 10 feet. Such a machine is put on shorter legs than those shown, and there is a quick-return movement for the platen, by which it can be moved quickly by power in either direction. Provision is made for conducting all oil into proper channels, by which it is returned to a tank and again pumped to the cutters in an abundant supply. It is supplied with a "harness" or outer support for the arm, or with a foot-stock like the larger machine. The feed worm and worm-wheel are of hardened steel, driving a bronze worm in a spiral rack. The screw by which the cutter head is moved vertically is graduated to indicate movements of the slide in thousandths or in sixty-fourths of an inch.





LONG FEED MILLING MACHINES.

The second illustration shows the 84-inch machine. The platen of this machine is set low on a bed supported by four pedestals, and is fed by mechanism which, in its essential features, is like that described above.

The saddle, upon which is mounted the driving spindle, is gibbed to the head, and has a vertical range sufficient to allow work eighteen inches high to pass under centers. From this saddle projects a large arm for outside support of arbor, intended for use on work where a back stand is not admissible. There is, however, as may be seen, a back stand or foot-stock of very solid character. The arm is readily removable when desired, and the foot-stock can be slid off its seat if required. In most cases, however, the arm need not be removed, its yoke being swung up out of the way, leaving the center of arbor free to engage with that on the foot-stock. This combination provides for operation on a wide range of work.

As shown in the engraving, the space between head and foot-stock is about twenty-four inches, but, if required, the foot-stock can be made to travel in line with the head, and its support be extended to any distance desired.

The method of driving the spindle allows of its free adjustment without disarrangement of the driving and feed belts. The driving cone has three steps for 3½" belt, or two steps for a 5" belt.

The machine as shown has longitudinal feed only, but where it is desired an automatic feed motion can be applied to the elevating screw in the head, giving feed in a vertical direction.

The table is arranged to run backward and forward rapidly by power, by a device which is not seen in the engraving. As the table weighs a ton, the relief to the operator by this improvement is obvious.

All the operations of the machine are intended to be conducted from the front side, without change of place by the operator. The feed can be thrown in or out by hand at any point, by means of a rod which connects with the latch, shown at the front of the cut, or is dropped automatically by an adjustable dog. While the work table is intended to run back by power, it can also be operated by hand, in either direction, by means of a large hand-wheel, not shown in the engraving.

The machine is massive in all its parts, and is intended for heavy milling of any description, but more particularly for shafting, railroad or engineering shops, being specially adapted for key-seating long and heavy shafting, finishing guide bars, connecting rods, etc.

It weighs 7,500 pounds, has a table 7 feet long, 20" wide, cross movement of head of 2", steel spindle 4" diameter at main bearing, and a cutter arbor 2½" diameter. The machine can be made to feed almost any desired length, and has been built to feed 12 feet, the bed in this case being 16 feet long.

These machines are built at the Hyde Park Works of the Brainard Milling Machine Co., 156 Oliver street, Boston, Mass.

The *Evening Post*, of this city, republishes from the *London Sunday Times* an article beginning with the following insulting paragraph:

As there have been several reports published of my interview with the deputation from Wrottenborough representing the labor interest, perhaps you will kindly allow me the use of your columns to give the true account of the incident. I need scarcely say that I have the greatest possible admiration for the workingman. I agree with one of the characters in Sir Arthur Sullivan's opera—"The Sorcerer"—"that he's a noble creature when he's sober." He is, indeed, and since the recent depression, and the decline of credit at the local beer-shops, the artisan of Wrottenborough has become a model citizen. So when I heard that these worthy sons of toil wished to interview me, I was only too delighted to meet them.

This is a fair sample of the entire article, which is entitled the "Trials of a 'Labor' Representative" and gives the details of an imaginary interview between imaginary workingmen and an imaginary M. P., in which the former are made to appear contemptible. The *Post* loses no opportunity of publishing things that it thinks tend to show that those who work for a living are necessarily low and contemptible creatures, and it evidently holds this opinion regarding them. Yet there are some people—a few of them—who read the *Post*, and depend upon it for their information regarding the merits and demerits of the so-called labor movement. As well take the word of his satanic majesty regarding the virtues of holy water.

AMERICAN MACHINIST

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Special Announcements.

☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draftsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once. Date on wrapper denotes week with which subscription expires.*

Subscription.

$3.00 a year in advance, postage prepaid, in the United States, Canada, and Mexico.
$4.00 a year to Other Countries, postage prepaid.

Advertising.

Transient, 35c. per line, each insertion.
"Business Specials," 50c. a line.

The American News Company,
Publishers' Agents, New York.
The International News Company,
BREAM'S BLDG'S, Chancery Lane, LONDON, E. C., ENG., will receive subscriptions for the AMERICAN MACHINIST, at 16/6 per annum, postage paid.

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The Western News Company, Chicago, Ill.
The Williamsburgh News Co., Brooklyn, E. D., N. Y.
The Wisconsin News Company, Milwaukee, Wis.

Subscriptions received in Australia by W. WILLIAMS, 17 and 21 Fink's Buildings, Melbourne.

NEW YORK, NOVEMBER 12, 1891.

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Helping Our Machinery Interests.

That the recent Reciprocity Convention between this country and Brazil is helping American machinery interests seems pretty well proven by the fact that American exports of steam engines and machinery to that country during the five months since the treaty has been in force, viz.: April 1 to September 1, 1891, amount to $1,299,020, as compared with exports of only $233 376 during the corresponding period of 1890, being an increase of nearly one million dollars for the five months.

The Reciprocity agreement allows American machinery to enter Brazil free of duty, while formerly duties ranging from 15 to 48 per cent. had to be paid.

English and American Locomotives.

The triangular discussion which has been going on with more or less regularity for some time between the *Engineer*, of London, on one side, and the *Engineering News* and the *Engineering Journal* on the other, respecting the comparative merits of English and American locomotives, has now arrived at the stage in which editor Forney has donned his war paint and is marshaling facts and figures which are very interesting. In the current issue of his journal he gives tables showing the mileage of English and American locomotives as compiled from the reports of railway officials in both countries. These tables show that the average annual mileage of English locomotives is 24,610 miles, while that of American locomotives is 35,650 miles. Commenting on these figures, Mr. Forney says:

It seems hardly necessary to dwell upon the advantage which American locomotives possess over their Anglican cotemporaries, in their greater capacity for doing what they are made for—that is, for running and puling trains. If we were arguing about horses, it would be apparent that an animal which would travel, on an average, 35 miles per day, was a much more serviceable and more valuable beast than one which would travel only 24 miles, even though the one which could travel farthest eat more oats than the other. The same thing is true of locomotives. Railroad companies buy, build and own them for the service they can perform. That is what gives them value. Our adversary, apparently, entertains—vaguely, perhaps—the idea that the "chief end" of a locomotive is to evaporate the largest quantity of water per pound of coal. A maximum evaporation of water is of some importance, but to a railroad company, crowded with traffic, and an insufficient equipment, the *service capacity* of their locomotives is paramount to everything else. Its influence on the interest account is a matter of simple calculation. Supposing a road, say in some new country, is equipped with 250 American locomotives. These, at $8,000 each, would cost $2,000,000. To do the same work, 375 English locomotives would be needed, at a cost—assuming the same price—of $3,000,000. That means, of course, $1,000,000 more capital and an annual interest charge of $50,000, without any allowance for deterioration. It also means more engine house capacity, more men to take care of engines, more yard and shop room, and a very great addition of expense in the locomotive department.

The last number of "Poor's Railroad Manual" gives the total number of locomotives owned by the railroads of the United States at 32,241. If the annual mileage of American locomotives did not exceed that of their English cotemporaries, 46,704 locomotives would be required to do the work which the 32,241 are now doing. That is, 14,463 *more* than are now owned would be required to do the work of our railroads. At $8,000 apiece, this additional equipment would cost $115,704,000.

The remark of the *Engineer*, that "every attempt that has been made by writers on the subject to prove the superiority of the American locomotive has been so far a dead failure," has already been quoted. It says, "The facts are too strong." Now we submit to our esteemed adversary and to our readers the question whether a $115,000,000 fact has not "considerable" strength.

Though Mr. Forney does not in this article, which is number one of a series, bring out any figures to show the relative weight of trains pulled by English and American locomotives, it is morally certain that, were such figures given, as we shall hope they will be in a future article, it would show that this superior mileage record of the American locomotive does not by any means tell the whole story, for it is well known that heavier trains are pulled here, and, supposing an American locomotive to make a mileage only equal to that of an English machine, if it pulls a greater weight of freight over a road which, in respect to grades, curves and condition generally, is inferior to that of the English roads, then it must be evident that it is a better machine, for the purpose for which both are constructed.

There Should Be More of Them.

In a recent issue of the *Bicycling World* we find the following letter:

Editor Bicycling World: We note that a system has grown up by which the bicycle papers are asked to insert misleading statements under the head of trade notices. As is known to riders, or should be known to riders, these notices are written by makers themselves, but without their signature We hereby announce that we will not hereafter make use of such advertising. We deprecate such methods, and hope that bicycle riders will appreciate the fact that they are cheap methods of trying to get something for nothing, and that many times these items contain statements which makers would be ashamed to sign. We will both pay for and sign our advertising.

Very truly yours,
OVERMAN WHEEL CO.

It would be a good thing for trade and technical journalism if there were more manufacturers who would take such a stand as this, since the fact is apparent that there are many journals which will insert in their reading columns anything coming from a manufacturer who is or is likely to be an advertiser, no matter how absurd it may be. It is true, as the Overman Wheel Co. state, that much of such advertising matter is of a character that would not be subscribed to by the manufacturer sending it out, but, of course, if he can get it published by some journal on its own responsibility, he can have no objection.

It should be clearly recognized, too, that matter pertaining to manufactured goods or machinery, which would be all right and perfectly appropriate for a circular or catalogue coming from the manufacturer, may be, and, in fact, usually is utterly unfit for publication in a trade journal, and if published there only results in injury both to the journal and to the manufacturer. Readers very quickly recognize an article which, in the words of the vernacular, "slops over," and they discount it accordingly, to the detriment of all concerned.

Of course the report that exhibits at the World's Fair coming from foreign countries were to be marked with their labor cost in those countries was not generally believed, as the scheme would evidently be entirely impracticable. But on some accounts it is to be regretted that it could not be done. Such an exhibit would be a wonderful educator, and in our opinion would show that our American labor, using our American machines and methods of manufacture, can and does produce most lines of manufactured goods at lower cost than they are produced anywhere else in the world. And we believe, too, that such an exhibition held ten years hence would show us to be still further in advance, for as automatic machinery comes more and more into use in manufacturing, the rate of wages per day will be less and less important, so far as labor cost of goods is concerned, and Americans, adapting themselves to the use of such machinery more readily than any other people, will continue to have the advantage in the use of it.

What the professional politicians may do for manufacturing interests is well illustrated by the condition of affairs at Trenton, N. J., where a reorganization of the city fire department having become an imperative necessity, progress in that direction has been blocked by the politicians, who hope to have things arranged after next spring's election so that they can reorganize it to suit them politically, which they could not quite do at present. In the meantime a fire which took place at Roebling's establishment would have done serious damage had not the company maintained a fire brigade which assisted the volunteers.

One of our greatest misfortunes is that municipal elections are contested upon national party lines, just as though it made any difference whether drunken men are arrested by Republican or Democratic policemen, or whether fires are put out by Democratic or Republican firemen.

But when, as sometimes happens, manufacturing establishments, as such, lend their influence for one party or the other, they have not much to complain of if things become badly demoralized.

A decision has recently been rendered by the Supreme Court of Pennsylvania, which to the lay mind has some curious features. A cigar makers' union had some labels prepared to be used by cigar manufacturers employing union cigar makers, the object of this label being to give smokers an opportunity for distinguishing between union made and other cigars. But the label, it seems, went further than this, and said that cigars not bearing that stamp were liable to be unclean, unwholesome, made in tenement house factories, etc. The object of this was, of course, to strengthen the union. An employer of non-union labor counterfeited this label, and when suit was brought to prevent his doing so, an injunction was refused, on the ground that the object of the union label was to cover the non-union cigar makers with opprobrium.

To the ordinary mind it will probably be a mystery how the non-union cigar maker is to be helped, so far as opprobrium is concerned, by the counterfeiting and still more general circulation of the label relating his shortcomings. If such a label does any one an injustice, an ordinary mortal would say that its use by anybody should be prohibited, not that everybody should be allowed to use it. The remedy seems to be, however, for the union cigar makers to confine the statements made on their label strictly to demonstrable facts regarding the origin and quality of the cigars to which it is attached. Then those smokers who for any reason prefer such cigars, as many for various reasons do, can secure them, and those who prefer the others can also be suited.

Some important changes are announced as having been made at the University of Wisconsin, in the College of Mechanics and Engineering. There have been added to these three entirely new chairs—a professorship of railway engineering, a professorship of electrical engineering and a professorship of machine design. The work of the existing chairs has been modified and developed so as to give a better division of labor and superior efficiency. The title of Professor of Civil Engineering has been dropped, because "in the progress of engineering science it has become too broad and indefinite." A professorship of bridge and hydraulic engineering has been developed from this chair. The force of instructors and facilities have been very much increased, and the university is better than ever prepared for educational work.

In our October 1st issue we published a few lines giving information furnished us regarding a legal controversy between the Ball Engine Co. of Erie, Pa., and the Ball & Wood Co. of this city. We have since been informed that the decision of the court referred to related to a demand for a preliminary injunction which the former company had made as against the latter company, and that the matters in dispute are yet to be tried on their merits.

One of the ministers of Brooklyn is reported as saying in a recent sermon, that "a person's friendship should be restricted to those who labor at some useful employment." If this were generally observed, what a great rearrangement of friendships there would be, and how utterly friendless many of those who now plume themselves as being at the top of society.

Literary Notes.

A new periodical devoted to engineering matters has made its appearance, under the name of *Cassier's Magazine*. The first number is certainly a very interesting one, among its contributors appearing the names of many of the best known writers on engineering subjects. The articles relate mainly to matters connected with the development and transmission of power, and are well illustrated and printed, the magazine comparing very favorably in these respects with the best literary magazines of the day. It is to be sold at 25 cents a number, and is published by the Cassier Magazine Publishing Co., New York.

Questions and Answers.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(487) J. F. A., Alliance, Ohio, writes: Please answer the following question through your columns. How do you find the degree of a curve as used in railroad practice? *A.*—See answer to Question 472, in our issue of December 11, 1890.

(488) X., Lancaster, Pa., writes: Please inform me through your Question and Answer column, in what issue of your paper I can find the proportions of ports and valves, and throw of eccentric for ordinary slide-valve engines. *A.*—May 1, page 5, 1890.

(489) H. T., Portland, Oregon, asks: Can you inform me through your columns what number of men are employed at the present time in Krupp's works, Essen, Germany? *A.*—10,500 men were employed in these works, besides 5,000 others in the mines and at the blast furnaces. We do not know how many are employed at the present time.

(490) F. W. C., Greenfield, Mass., writes: Can you tell us whether the screw shafts on the Atlantic steamers are made of iron or steel? *A.*—Many are made of iron, a few of steel. 2. If of steel, are they cast or forged? *A.*—Forged from ingots which are cast for the purpose. 3. Are the shafts hollow or solid? *A.*—Occasionally both iron and steel shafts are made hollow; they are bored out.

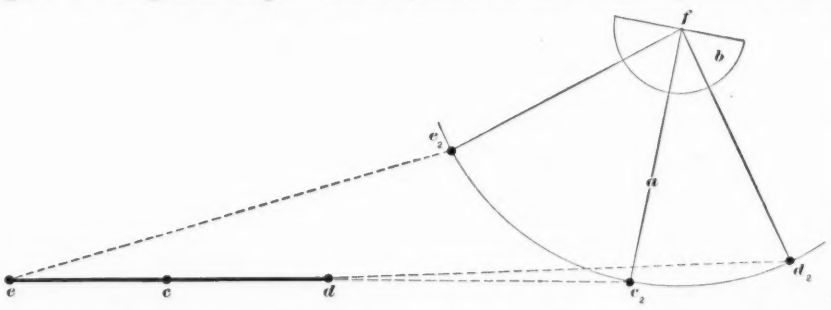
(491) P. R., Janesville, Wis., writes: I should like to have you publish in your columns the names of works treating on the mechanical powers and principle of mechanisms, and their practical application to machinery of all kinds, and especially to workshop machinery? *A.*—To obtain this knowledge you will have to study books treating on several branches of engineering. For a list of these books we refer you to our issue of February 19, current volume.

(492) W. G. S., Montville, N. J., writes: Kindly answer through your columns what size of pipe would give the best result on a battery of six boilers. Two of these are 100 horse-power, one 75, two 50, and one 35 horse-power. The pipe extends about 250 feet from the boilers. My idea is to make the main pipe 8 inches in diameter, reducing it toward the last boiler to 6 inches, and then to 4½ inches. *A.*—Your choice of diameters is about right. We say *about*, because the term "horse-power," when applied to boilers, is often somewhat indefinite. 2. How high above the boilers should the steam pipe be? *A.*—If no expansion joints or ball and socket joints are placed in the steam pipe, so as to allow for the expansion, we should place the steam pipe from 6 to 8 feet above the boilers.

(493) J. S., Brooklyn, N. Y., writes: I desire to become a marine engineer. I am 26 years of age and consider myself to be a first-class machinist, with twelve years' experience in different kinds of machine work, and have some knowledge and experience in marine engine work. Please inform me through your columns how I can get into the business of marine engineering, and what kind of school or institute should I attend so as to enable me to take out a marine engineer's license? *A.*—We do not know of any school which prepares persons for passing an engineer's examination. You may have to act as fireman in a vessel before you can pass the examination. We should advise you to apply at the office of the Inspector of Steam Vessels, Post Office building, New York, where you will obtain the information necessary to guide you in your future action.

(494) B. E., Louisiana, writes: Kindly oblige me by giving your opinion on the following: I am interested in a new electric light plant and steam laundry about to be erected. The dynamos will be one 1,000-light incandescent and one 200 arc light. The laundry will require about 25 horse-power to drive the machines. There is considerable dispute regarding the most practical and economical engine to use. My plan is to use a low-pressure engine and belt from three driving pulleys on shaft coupled to engine shaft direct; engine is to make, say, 85 revolutions. On the other side a high-speed engine is proposed for the electric light plant, and a medium speed engine for the laundry. Both of these engines are of the ordinary slide valve type. It appears to me that there can be no comparison in question of economy between these two classes of engines. However, I may be in error, and any information regarding the foregoing will be appreciated. *A.*—You will doubtless run the laundry during the day, and the electric light plant will, of course, have to run during the night. We should therefore adopt the second plan mentioned—that is, use a separate engine for the laundry. In regard to the particular builders of the engines which you mention, we cannot advise you, as we are in nowise interested in the sale of any class of engines or machinery; but we can safely say that you will save money by placing the whole matter in the hands of a competent engineer, who cannot afford to have his reputation injured.

(495) T. E. M., Albany, N. Y., writes: In your issue of October 8 a question is asked concerning reducing motion for indicators. In the answer you say, "When the crosshead is at midstroke the lever *a* should stand in a vertical position." Why should this be necessary, when the semi-circumference *b* is true with the pivot *f* upon which the lever swings? Would not the motion be coincident with the piston travel if the lever *a* did not stand in a vertical position? I am aware that most books explain this matter as you do. Will you please explain, and by doing so oblige one of your readers? *A.*—If the lever *a* does not stand vertical to the line of motion of the crosshead when the latter is in the center of its travel, the motion of the indicator drum will not be coincident with that of the crosshead. This condition is shown in the accompanying diagram. Let *e d* represent the motion of the crosshead; *c* the center of its motion; *f* c_2 the position of the lever *a* when the crosshead is in the center of its travel; then *c* c_2 will be the length of the link connecting the lever *a* to the crosshead. Let the arc e_2 d_2 described from the center *f* be the path of the pin in the lever *a*. Now let us find the position of the lever *a* when the crosshead is at the end of the stroke. From *d* as a center, and with the radius *c* c_2, describe a short arc cutting e_2 d_2 in d_2; join *f* and d_2 by a straight line; then this line will represent the position of the lever *a* when the cross head is at the end *d* of the stroke. Again from *e* as a center, and with a radius *c* c_2, describe a short arc cutting e_2 d_2 in the point e_2; join e_2 and *f* by a straight line; this line will then represent the position of the arm *a* when the crosshead is at the end *e* of the stroke. Now notice the result. We have seen that *f* c_2 represents the position of the arm *a* when the crosshead is in mid-position; consequently when the crosshead travels from *c* to *d* the pin in the lever *a* will describe the arc c_2 d_2; and when the crosshead moves from *c* to *e*, the pin in *a* will describe the arc c_2 e_2. But the arc c_2 e_2 is much greater than the arc c_2 d_2, which shows that the motion of the pin in *a* is not symmetrical, thereby giving to the indicator drum a motion which is not coincident with that of the crosshead. If, on the other hand, the lever *a* stands perpendicular to the line *e d* produced when the crosshead is at mid-stroke, then c_2 e_2 and c_2 d_2 will be equal, and give a more correct indicator card.



Business Specials

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

George B. Grant—Gear Wheels. See p. 20.

Link-Belting and Sprocket Wheels.

Send for Catalogue of Link-Belting.

Over 50,000,000 feet of Link-Belt in use.

Link-Belt Engineering Co., Philadelphia and N. Y.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

"The Bulldozer," a new departure; forging by pressure. M'f'd by Williams, White & Co., Moline, Ill.

Pattern and Brand Letters. A variety of sizes and styles. Heber Wells, 8 Spruce St., New York.

Davis Key-Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty St., N. Y.

Ice and Refrigerating Machines, 170 sold, and all successful. David Boyle, 521 Monroe St., Chicago, Ill.

"How to Keep Boilers Clean." A 96-page book mailed free by Jas. E. Hotchkiss, 112 Liberty St., N. Y.

Selden Packing for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt St., N. Y.

Light Special Machinery and Tools to order. The Meriden Machine Tool Co., Meriden, Conn.

Our Automatic Gear Cutting Machine will increase production 50%. The Superior Mach. Wks, Clev'd, O.

Boston Gear Works, Boston, Mass. Gear cutting of every description; noiseless gears a specialty.

$13.00 I. Dea L. Drawing Stands. The original Send for postal. W. S. Rogers, Troy, N. Y.

One Star Hack Saw will cut steel a whole day without filing.

S. A. Smith, 23 South Canal Street, Chicago, Ill., agent for Holbrook's Raw Hide Blanks for Gears.

Adamantine Adhesive, stops leaks in boilers and joints. Charles Barnes & Co, Cincinnati, Ohio.

Save small iron from foundry refuse. It pays Use the Woodruff Pat. Separating Machine, Audubon Machine Works, New Haven, Conn.

For the latest improved Eccentric Hook, Connecting Rods and Stub Ends, address T. C. Dill Machine Company, Philadelphia, Pa.

Thos. Pray Jr., 193 *Times* Build'g, N. Y., attends to calls for Indicating and Testing Steam Plants, Water-works, Locomotives & S. S's. Write or call.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker St., Philadelphia, Pa.

S. W. Card & Co., Mansfield, Mass., make everything in the line of Taps and Dies. S. A. Smith, 23 S. Canal St., Chicago, Western Agent.

For best Return Steam Traps, Pressure Regulators, Positive-Acting Pump Govs., Back-Pressure Valves. T. Kieley, 11 W. 13th St., N. Y. Send for des'n

For the Latest Improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., 138 Jackson St., Chicago, Ill.

Milliken & D'Amour, No. 151 Cedar street, New York City, designers and builders of labor saving and automatic machinery and tools to order.

For Sale—New and 2d-hand lathes, planers, drills, shapers, engines & boilers, belting, pulleys and shafting; list sent free. W. P. Davis, Rochester, N. Y.

N. Y. City Bolt & Nut Co., Limited, 33 and 35 Desbrosses St, N. Y. City, manufacturers of Machine Bolts of every description. Write for estimates.

25″, 32″, 37″, 42″ — "Only Drill Press built on 'Ko-rekt' principles, even if they come from Jersey." Gould & Eberhardt, New Ark, N. J.

Complete treatise on Screws and Screw-making, with clear and concise explanation of the methods; 95 illustrations. Price, $1.25 postpaid. E. & F. N. Spon, 12 Cortlandt Street, New York.

"Hawkins' Maxims and Instructions for the Boiler-room." 10 Parts, 25 cents each. Catalogue free. Theo. Audel & Co., Pubs., 91 Liberty St., N. Y.

De Lamater Screw Propeller Wheel, made only by The Samuel L. Moore & Sons Co, Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

Club Rates.—If no one is getting up a club for the AMERICAN MACHINIST in your town or establishment, send for Circular of New Club Rates, and try it yourself. Address AMERICAN MACHINIST, 96 Fulton St., New York.

"Binders" for the AMERICAN MACHINIST. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. American Machinist Publishing Co., 96 Fulton St., New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2, postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

Manufactures.

A new foundry is being built at San Francisco, Cal.

A three-ton straw paper-mill is to be established at Lincoln, Ill.

The Mobile (Ala.) Brewery will put a 50 ton ice machine in its brewery.

The Whitlock Coil Pipe Company is to erect a factory at Elmwood, Conn.

The Coburn Trolly Truck Company will erect a new factory near Holyoke, Mass.

A brick extension is being made to the engine house at the Bath (Me.) Iron Works.

The Flenniken Turbine Company, of Dubuque, Iowa, propose to enlarge their plant.

Receivers have been appointed for the Hainsworth Steel Company, of Pittsburgh, Pa.

Negotiations are pending for the establishment of an electric light plant at Staunton, Va.

The Augusta (Ga.) Railway Company is increasing the capacity of its electric power plant.

It is said that large sheet-mills are to be erected at Millerstown, Pa., with Pittsburgh capital.

C. B Gravely, of Henry County, Va., is reported as to establish an iron foundry in Salem, Va.

H. L. Freeman is inviting bids for building a bridge across the Line Creek, near Senola, Ga.

The Tampa Bay Ice Factory (St. Petersburg, Fla.,) has recently been remodeled and improved.

The Madison Car Company, of Madison, Ill., has increased its capital stock from $500,000 to $1,000,000.

The Pottsville Iron and Steel Company, of Pottsville, Pa., is having plans prepared for a new blast furnace.

The Aluminum Alloy Metal Company, of Hampton, Iowa, have been incorporated, with a capital of $25,000.

The Eagle Rolling-mill Company, of New Ulm, Minn., capitalized at $300,000, have filed articles of incorporation.

Some further additions are to be built to the Farrell Foundry and Machine Company's plant, at Ansonia, Conn.

E. W. Pike, of Chicago, Ill., has been investigating with a view of erecting an electric light plant in Taylor, Texas.

The American Foundry Company, of Edison, Washington, is to erect a plant for the manufacture of car wheels.

It is said that an English syndicate is making efforts to purchase the Fort Payne (Ala.) Coal and Iron Company's plant.

The Union Tin-plate Company has been organized, to manufacture terne-plate at Wood's Run, Allegheny County, Pa.

The Steam Heater Company, of Susquehanna, Pa., is talking of erecting a new and larger machine shop next season.

The Empire State Phosphate Company, Citrus County, Fla., is reported as to put in new machinery at its phosphate mines.

The Laconia (N. H.) Car Company is at work on an order for 200 cars for the Burton Stock Car Company, of Boston, Mass.

The Augusta (Ga.) Ice Company will increase the capacity of its ice factory from twenty-two to thirty-two tons of ice per day.

The Monterey Foundry and Machine Company have been chartered to do business at Monterey, Mexico, and Hutchinson, Kan.

Cincinnati (Ohio) parties will probably organize a stock company for the purpose of operating the Dayton (Ohio) Nut and Bolt Works.

It is expected the Fisher Manufacturing Company, Fisherville, Mass., will build on a large addition to their large mills in the spring.

The Waco (Texas) Gas Company will put in its electric light plant, it is stated, two 750 light dynamos, and a 150 horse-power engine.

An electric light or gas plant will be established for the purpose of lighting the city of Mt. Sterling, Ky. The mayor can give information.

Creswell's iron foundry, Philadelphia, is to be removed to a new site, where a two-story brick structure, 190x70 feet, is being erected.

The Greenfield Boiler Company's works, at Greenfield, Mass., have been sold to Utica (N. Y.) parties, to which place the plant will be moved.

The Bertha Zinc Works, Pulaski, Va., is reported as to erect several additional furnaces, and as to enlarge the operations at its zinc mines.

There is water-works agitation in Pasadena, Cal.; St. Albans, Vt.; South Haven, Mich.; Jamestown, N. Y.; Eagle Pass, Texas; Flatonia, Texas.

Pittsburgh (Pa.) parties are investigating with a view of establishing in Radford, Va., works for the manufacture of wood-working machinery.

Negotiations are pending for the sale of the Fort Payne (Ala.) Coal and Iron Company's properties, valued at $2,000,000, to an English syndicate.

The Border City Ice and Coal Company, Fort Smith, Ark., has increased its capital stock to $100,000, and will put in a 50-ton ice machine.

The city council of Memphis, Tenn., has adopted a resolution providing for the construction of a $10,000 iron bridge over Gayoso Bayou at Memphis.

The Superior Land Roller Company has purchased land at Gouverneur, N. Y., where it will erect a building for the manufacture of its goods.

A company is being organized in Lockport, Ill., for the manufacture of plain and barbed wire, which will give employment to a large force of men.

The St. Louis & Southwestern Railroad Co. (office, St. Louis, Mo.,) is reported as to remove its machine shops from Pine Bluff, Ark., to Tyler, Texas.

The Ashland Steel Company, of Ashland, Ky., will begin active operations about December 1st. The buildings of the plant are very nearly completed.

The Continental Bolt and Iron Works, of Chicago, has been incorporated by A Egerton Adams, F. M. Steele and D. P. Donelson, with a capital stock of $60,000.

R. D. Shook is reported as having purchased the old mill between Scottsboro, Ala., and Focklen, and as to rebuild, put new machinery in, and operate same.

The Campbell Frog Works, at Bucyrus, O., has been sold by the assignee to Judge F. Hipp. It is stated that a stock company will be formed to operate the works.

A supposed incendiary fire recently completely burned Joseph O. Bryer's saw-mill and John Taylor's tackle and pulley shop at the foot of Tatnall street, Wilmington, Del.

The Paragon Manufacturing Company has been incorporated at New Haven, Conn., with a capital stock of $16,000. The company will manufacture hardware, tools and specialties.

Thomas Carlin's Sons, Lacock and Sandusky streets, Allegheny City, Pa., issue a circular showing a great variety and range of machinery which they have on hand, ready for delivery.

The Austin (Texas) Rapid Transit Railway Company will put new machinery in its power plant, as previously stated; it consists of a 350 horse power engine, and a 250 horse-power dynamo.

The Phœnix Wrench Manufacturing Company, of Chicago, Ill., has been incorporated, with a capital of $300,000. Incorporators are E. L. Pickard, Chapman Seabury, F. M. Bardwell and D. H. Porter.

The Vulcan Iron Works, at New Britain, Conn., has contracted for a new foundry, to be completed Nov. 15. The building will be 70x278 feet, of brick, stone and iron, and equipped with two furnaces.

The city council has adopted a resolution granting to H. G. Allis, H. P. Bradford and J. M. Taylor the privilege of erecting and operating an electric light, heat and power plant in Little Rock, Ark.

The Lewis Foundry and Machine Company, Limited, of Pittsburgh, are erecting a new foundry department. The old building has been torn down and an iron building, 95x100 feet, will be substituted.

The Joliet Sheet Rolling-mill Company, of Joliet, Ill., has been incorporated, for the manufacture of iron and steel products, by Samuel Fewtrell, M. Calmer, and others. The capital stock is placed at $100,000.

The Chilocopico Phosphate Works has been organized, with H. F. Crawford, president, for the purpose of operating the phosphate works recently established on the east side of Peace River, at Fort Meade, Fla.

The Lewis Valve Gear Company, of East St. Louis, Ill., has been incorporated, by W. J. Lewis, L. B. Fisk and E. S. Marshall, for the manufacture of valves, pumps, etc. The capital stock is placed at $600,000.

Messrs. L. M. Rumsey, C. D. McClure and Paul A. Fusz have incorporated the Madison Railway Equipment Company, of Madison, Ill., with a capital stock of $100,000. The company will deal in railway supplies.

James Leffel & Company, Springfield, Ohio, have recently received an order from the Marinette & Menominee Wood Pulp Paper Company, of Marinette, Wis., for eighteen turbine water wheels, to develop 3,500 horse-power.

The Acme Railway Switch Company, of East St. Louis, has been incorporated, with capital stock of $500,000, for the manufacture of railway switches. J. E. Chambers, George Broack and Charles E. Long are the incorporators.

The corporation of the city of Winnipeg, Man., are advertising for tenders for the supply of 18,000 feet of vitrefied sewer pipe, ranging from nine inches to twelve inches in diameter. Tenders will be received up to November 12.

The South Florida Electric Company has been incorporated at Bartow, Fla., with F. J. Maywald, president; Frank Clark, secretary, and C. J. Seeger, treasurer, to construct telephone lines, erect electric light plants, fire alarms, etc.

The Connell & Dengler Machine Company, capitalized at $100,000, has been incorporated, at Rochester, N. Y. The object of the company is to manufacture and sell machinery and machinery supplies, and to operate a foundry.

A saw-mill belonging to the Santa Clara Valley Mill and Lumber Company, near Boulder Creek, Cal., was recently burned. Loss, including manufactured lumber, $50,000. No insurance. The mill was one of the largest in the county.

The Thayer & Britton Company, of Chicago, has been formed to manufacture and sell car and locomotive bearings, brass and bronze castings, etc.; capital stock, $100,000; incorporators; Frank W. Thayer, Frank H. Britton and Louis Danzier.

Gould & Eberhardt (Newark, N. J.,) have issued a new catalogue, relating mainly to drill presses. Improvements are noted that make the catalogue particularly interesting to mechanics and manufacturers. It can be had by mail upon application.

The Leavitt Machine Company, of Orange, Mass., has decided to build an addition to its shop at once, and build an office outside the shop. The business has increased about fifty per cent. within three months, and outgrown the present quarters.

P. B. Perkins, of Los Angeles, Cal., proposes to establish a works at San Diego for the manufacture of mining machinery, hydraulic pumps, traction and stationary engines, and iron and steel work generally. The estimated cost of the plant is $150,000.

The Cushman Iron Company, recently incorporated, has commenced work on the foundations of its plant at Roanoke, Va. The building will be in size 75 feet by 45 feet, with engine and boiler-room additional. Work on the plant will be pushed, and operations soon commenced.

The contract for the erection of a foundry for the Berlin Machine Works, at Beloit, Wis., has been let to the Northwestern Contracting Company, of Chicago. Plans also are being prepared for a foundry for the Eclipse Clutch Works, at the same place. It will be 85 feet by 90 feet.

The Burdon Water Lift Company has been incorporated, at Jacksonville, Fla., with J. R. Tysen, president; Samuel Wolf, vice-president, and P. Sattelkan, secretary, to manufacture the patent Burdon water lift and railroad water supply tank. The authorized capital stock is $150,000.

John Q. A. Houghton, of Baltimore, Md., and others, have incorporated, at Harper's Ferry, W. Va., the Houghton Machine Manufacturing Company, to manufacture the patent button-hole machine of John Q. A. Houghton. The capital stock is $10 000, with privilege of increasing to $500,000.

The Damascus Steel Company, at Denver, Colo., has been formed, for the manufacture of steel and steel tools under certain patents. The capital stock is placed at $1,000,000. S. P. Rose, G. Z. Dimmit, C. G. Hathaway, T. J Cooper, J. S. Mosby, Jr., and L. D. York are the directors of the company

In these columns, last week, we referred to the rumor that the Atlas Tack Corporation (A. Field & Sons), Taunton, Mass., would remove to Somerset, Mass. A note from the company informs us that there is no intention of moving the works, the present location being desirable, and business good.

The work of construction on the new shops of the Florida Central & Peninsula Railroad, at Fernandina, Fla., has commenced. These shops will take the place of those at Tallahassee. The shop equipment at the latter place will be removed to the new plant, and other machinery will probably be added.

The mill, boarding-house, store, office, and several tenement houses belonging to the Sweet Cedar Company, at Arthur's Bay, eighteen miles north of Menominee, Mich., were recently burned. A large quantity of cedar and pine timber was also destroyed. The loss will probably reach $50,000, with no insurance.

The Robb Engineering Company, Amherst N. S., is applying for incorporation, with a capital stock of $249,000, for the purpose of enlarging the business heretofore conducted by A. Robb & Son in iron and brass founding and general engineering, and the manufacture of all kinds of machinery, engines, boilers, etc.

The Cushman Iron Company, of Roanoke, Va., has been incorporated, with a capital stock of not less than $15,000, nor more than $50,000. The company will manufacture ornamental and builders' wrought and cast-iron. The officers are: C. G. Cushman, president; John Bird, vice-president, and A. J. Coffin, secretary and treasurer.

The erection of the zinc works at Wenona, Ill., has already proceeded so far that two furnaces are completed, and four will be ready by the first of December. It is only intended to finish the four this fall. When the plant is finally completed, it will comprise sixteen furnaces, employing about 200 men, and making about 40,000 pounds of spelter a day.

The D B Smith & Company has been incorporated, with $20,000 capital, to manufacture all kinds of agricultural implements, at Deerfield, N. Y. The location of the principal office is at Deerfield Corners, Oneida County. The directors are as follows: Dewane B. Smith, Charles H. Poole, Edwin H. Risley, Thomas L. Benham, Robert B. Poole, all of Utica.

John Becker Manufacturing Company, makers of milling machines and special tools and machinery, is building a brick shop at Fitchburg, Mass., 43 feet by 155 feet; also another brick building, to be devoted to brass founding. The company, now located at 150 Pearl street, Boston, will begin to remove to their new shops about the 20th of this month.

The new works of the Alabama Rolling-mill Company, Birmingham, which were destroyed by fire last June, are about completed, the puddle-mill has started up full time, and the finishing-mill will resume in about two weeks. Seven new puddling furnaces and two gas-heating furnaces have been added to the plant, which will increase the output to about 80 tons of finished iron per day.

The Cultivation of Inventive Capacity.

BY LEICESTER ALLEN.

The success which has attended my educational experiment, as evinced by the numerous solutions forwarded and by the expressions of approval which accompany these solutions, is extremely flattering. Nearly all the letters containing solutions or attempts at solutions also convey expressions of approval.

A letter from Prof. De Volson Wood, of Stevens Institute, Hoboken, N. J., seems to indicate that the idea has occurred to instructors in technical institutions, but does not make it clear that any systematic instruction has yet been organized. He writes as follows:

"Every year I give to my students problems in designs, the object being to exercise their ingenuity and inventive faculty. It is not only profitable to them in exercising independent thought, but I seek to add to its value by classifying their solutions and reviewing them before the class, showing practical and impractical methods. Usually a variety of solutions are reported, some of which may be remarkably simple and others exceedingly complex.

"For instance, it will be observed that in the ordinary engine the valve is moving in a direction opposite to that of the piston, as the latter is nearly the end of the stroke; now devise an engine such that the valve shall move in the same direction as the piston while it begins to open the port. Do the same without crossing the steam passages.

"Again, it is observed that the piston makes one double stroke while the fly wheel makes one revolution. Now devise an engine such that the piston shall make four single strokes with one revolution of the fly-wheel without gearing. These will give some idea of the general character of these problems.

"A few days since I asked the class to solve the problem proposed by Mr. Allen in the AMERICAN MACHINIST of October 8th, the solution for which I enclose. The simplest ones had been upon a previously existing uniform reciprocating motion, and if the author of the problem intended to restrict the case to one in which the plant should not contain the elements which he excludes, then their solutions are only partial. The most difficult part of the problem might be to produce the uniform reciprocating motion. I enclose a solution of my own which requires little, if any, explanation.

"Through the slide *a* is a pin *c c*, the lower part projecting through a slot on the platform of which it slides. A piece *b*, projecting from the endless belt, engages the pin until it is freed from it by changing its course in running around a pulley, leaving the slide *a* at rest until the projection *b* returns along the under side of the platform, when it will again engage the pin and force the slide in the opposite direction. The uniform motion of the belt may be secured by a rotary engine, turbine or other similar motor. The motion should be slow, or else a stop will be required to bring the slide to rest; for, if it went fast, it would by virtue of stored energy move on after it was disengaged from the driving power."

The solutions referred to as having been given by the students of Stevens Institute at Prof. Wood's request, and which he has kindly forwarded, are, as he says, "only partial," as they do not meet the sixth restriction accompanying the problem, which requires the part directly moving the slide to have a uniform motion. The solutions are, however, ingenious, and were wrought out by Messrs. R. Riege, E. R. Douglas, Frank J. Weeks, C. A. Huppertz, Beattie A. Inglis and S. Matsuda in conjunction with Mr. R. E. Chandler. These solutions, though interesting, are not given, as they do not solve the problem as stated by me in my first article.

I reproduce the solution of Prof. Wood. This solution is valuable, although it corresponds in general principle to that of Mr. E. H. Powers, of Beloit, Wis., which appeared in my last article. It will be perceived that Prof. Wood obtains a longer period of rest at the end of the stroke of the slide, by the employment, at each end of the guide-way, of two idler pulleys *e*, intervening between the sprockets *f*, which is a valuable feature shown in no other of the solutions forwarded.

I shall subsequently show a modified form of the movement as presented by Prof. Wood, and give practical reasons for the modification in its application to the shuttle motion of a loom, a purpose which was intimated in my last article. Before doing so, however, I will review such solutions and attempts at solutions as have been forwarded to me at the present writing. In those who have failed to give a correct solution the chief fault appears to have been a neglect to observe rigidly the sixth restriction. That is, that the direct mechanism propelling the slide shall have a uniform motion. The word "uniform" was used by me in its broadest sense, and was expected to be so understood. It did not mean uniform reciprocating motion or uniform intermittent motion. The solutions forwarded by Prof. Wood from the students of the Stevens Institute are all defective in this particular.

Correct solutions have been received from the following gentlemen:

Mr. W. M. Barker, of Meadville, Pa., gives a solution substantially the same as that given by Mr. Clough, of Springfield, Mass., whose solution appeared in the last article.

Mr. Charles P. Smith, of Lynn, Mass., gives a solution which corresponds almost exactly with that of Mr. Powers.

Mr. Amos B. Cunningham, of Plainfield, N. J., gives a solution substantially the same as that of Mr. Clough, but he adds thereto a guide-way for the support of the endless chain, and his tripping motion is made to depend upon peculiarities of construction in the slide; that is to say, recesses in the guide-way actuate the tripping mechanism at the proper points.

Mr. G. W. Phillips, of Providence, R. I., gives two solutions, one of which conflicts with the sixth restriction, while the other is substantially the same as that of Mr. Clough.

Mr. E. W. Roberts, of Cornell University, gives a solution which is substantially the same as that of Mr. Powers.

Mr. John P. Slocum, of Providence, R. I., gives a solution substantially the same as that of Mr Clough, the modification spoken of by him, to wit, the use of two lug links, one following the other to make the time of rest short, is not explained clearly. As described, it appears to be wrong in principle, and I think it would not work.

The attempted solution of Mr. W. H. Raebam, of Galt Cut (State or Territory omitted), is faulty in that it involves substantially the use of a double rack-and pinion movement, the slide being formed in such manner as to form an upper and lower rack, each containing a single tooth and a double-toothed pinion acting to give the motion.

Mr. William N. Risdon, of Watsonville, Cal., also sends a faulty solution, the motion of the direct driver or pin, which works in a slot and which is connected with the slide to be moved by a rod, not moving with a uniform motion; besides, the rod itself is too nearly allied to a pitman (which was excluded) to permit this to be considered a good solution.

Mr. J. G. Fischer, who has omitted to date his letter and give his address, sends a solution which appears very ingenious, but as it is not clearly explained I am unable to discuss it further.

Mr. Herbert W. Pudan, of Sacramento, Cal., sends a solution which is substantially the same as that of Mr. Risdon, and possessing the same defects.

"H.," of Auburn, N. Y., sends in a neat drawing, but his solution is not correct, as he uses reversing gear, making the motion of the direct driving motion intermittent instead of uniform.

Mr. William M. Mahon, of West Superior, Wis., shows two sprocket wheels and chains

carrying dogs which engage the slide, the motion of the driving shafts to be reversed. It will at once be seen that this violates the sixth restriction.

Mr. Adam Gerlock, of Philadelphia, sends in a solution which is not clearly shown and explained, but which appears to include two sets of sprocket wheels and two belts with trip catches running in opposite directions. Beyond this, the statement of his solution is too meager to be understood.

Mr. Robert T. Johnston, of Scotch Plains, N. J., has undoubtedly the correct notion, as shown in the solutions of Messrs. Clough, Powers, and Prof. Wood, but his drawing and explanation are not sufficient to justify further discussion.

Mr. O. B. Lyon, of Chicopee Falls, Mass., uses a crank motion, which is excluded by the conditions.

The solution of Mr. Herman Oberg, of Watertown, N. Y., is so unique and ingenious as almost to warrant its reproduction. He, however, has also failed to see that the intermittent motion of the rod which moves the slide is excluded by the sixth condition appended to the problem.

Mr. James P. Hayes, of Brooklyn, has also furnished a unique solution, but it does not meet the requirements of uniform motion.

The solution of Mr. W. P. Tarbell, of Milford, N. H., may be a good and mechanical movement for many purposes, but if he scans his solution more critically he will perceive that the rotating tappets *e* are really excluded by the restrictions of the problem, as this is substantially a gear wheel with two teeth. The letter accompanying his solution is the only one, with the exception of Prof. Wood's, in which the distinction between invention and the study of best construction, which logically follows invention, is clearly made, but he confounds *discovery* with *invention*. Invention proper is as purely logical in its method as a geometrical demonstration. It reasons from premises, step by step, to conclusions. Mr. Tarbell remarks that "in designing this movement I aimed for simplicity of construction and for positive movements; although, as I understand it, the problem was not to determine the *best* way of doing a thing, but rather to discover a way that would meet all the requirements of the problem, even if it proved to be a poor and unmechanical device." In these words Mr. Tarbell expresses a perfectly clear idea of the purpose of the problem, which was to exercise inventive faculties regardless of questions of strength, durability, etc., which enter into good mechanical construction. I refer, in this connection, to my definition of *good mechanical construction*, as stated in my last article, and I think, before we have done with this problem, we shall see that my position regarding the logical sequence of the consideration of good mechanical construction will be fully justified.

Mr. Samuel H. Libby, of Lynn, Mass., sends in a solution which is *sui generis*. He proposes to accomplish the movement described in the problem by means of electrical helices and a reciprocating core; but as the reciprocating core, which is to be relied upon for the direct movement of the slide, has not a uniform motion, his solution also conflicts with the sixth condition of the problem.

I will next give a diagram showing a modification of the solution as presented by Prof. De Volson Wood, and, with a brief explanation, add to it certain queries, which shall constitute a new problem for further consideration in the application of this movement to the actuation of a shuttle carried on an oscillating lay.

A much sought desideratum, namely, a really practicable method of water-proofing leather and rawhides, is claimed to have been practiced by an Austro-Hungarian chemist, with much success, his method being to impregnate the material with a gelatine solution, combined with some mineral salt to coagulate the gelatine in the pores. An effective mixture for producing the desired result is found to be the following: Twelve hundred parts water, fifteen parts gelatine, and five parts potash bichromate; or fifteen hundred parts water, fifty parts gelatine, and thirty parts potash bichromate. The temperature of the solution may vary from 50° F. to the boiling point. When the bichromate percentage is small, the liquor is mixed cold, and the leather or hide is immersed for a period of some twenty four hours. As the proportion approaches the point of saturation the temperature must approximate more nearly to boiling, and the time of immersion be reduced until it becomes momentary.

Uncle Ben's Letters.

No. 6.

DEAR TOM: It is a good while since I have heard from you, but I am glad you waited a few weeks before attempting to report upon your success as superintendent of the Eagle Iron Works. In a new place, one's opinions of men and things change a dozen times in the first month.

You say there are a good many old-fashioned tools about the place, and that you cannot, therefore, get out as much good work as you have been in the habit of seeing done. Of course. I wish you could see the shop where I gained my first experience as "boss." It was built and furnished before I was born, and was a mere jam of ramshackle, chattering lathes, a light scratch, slow-return planer, and worthless, unfit devices of every sort. For twenty years the place had been run with no purchases of new tools, and the fewest and meanest repairs to old ones. When anything actually gave out, so something had to be done, you know, they'd give it merely "a lick and a promise," to get through the present job. And yet I contrived, after a while, to induce the proprietors to get some decent tools, and you can do so too, if you set about it in the right way.

But you must be patient, and do this gradually. It will very likely require a good deal of tact upon your part. You say the new owners of your works bought out the whole plant only a year ago, and I'll warrant they paid well for all the tools in the place. They don't wish to think they were imposed upon, or made a poor bargain, and you will find it a thankless business to criticise things right and left, as they no doubt deserve. You know you don't like a workman who is always complaining of his tools. Even if what he says is all true, you get very tired of hearing it.

Try not to be the habitual bearer of bad news or unpleasant facts to your employers. You will often know discouraging and vexatious things which it isn't worth while to tell them. If you are always cheerful and full of courage, they will learn to lean on you, and like to confide in you, because, by your manner, you flatter their hopes of success.

Before flooding the firm with demands for new tools, make a thorough survey of the old ones, and get them into as good shape as possible. And when you do propose new purchases, begin with articles which they haven't got—a turret lathe, a milling machine, or anything else that will show them, by its work, the great economy of using modern tools. You see they are not bred to the business, as you are, and you must educate them gradually. If you can get one good heavy modern tool into the shop, it will be a revelation to them.

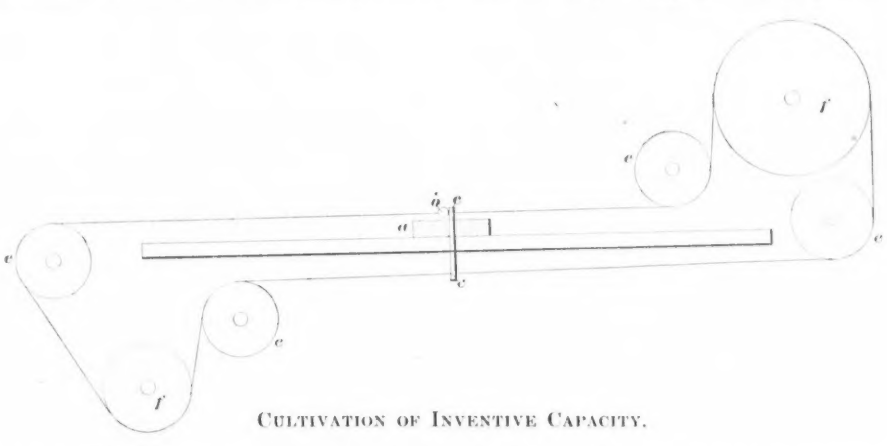
But, speaking of repairs to the old plant, I'd draw the line on the old wooden frame gear cutter, with its piled-up "cutters," in the back room up stairs. Give that apparatus a kindly rest, and send and buy your gears until you can get a real gear cutter. What a feat it used to be to operate one of those traps! and what "gears" they did cut!

You say the shop is full of good, reliable men. This, for you, is much more than half the battle. I hope you will never be brought, as so many have been, to appreciate good men by the lack of them.

There is, to my mind, a very plain reason for the fact that some shops seem to attract good men, as a matter of course, and in others they are conspicuous by their absence. It all lies in the treatment of the men by their superiors. Where there is, among the workmen, a feeling of being intelligently appreciated, there comes an enterprising wish to please that tends powerfully to success. No man ever did a good job, or an extra big day's work, without knowing it very well himself; and if you expect to have any success at all as a manager of men, you'll acknowledge that a workman has done well, and make a point of recognizing a good job when you see it. I have known bosses whose only idea of managing men was to push them incessantly, and to pretend never to be satisfied with anything they did. Never a good natured remark, nor an encouraging word. No other treatment for the best man in the place, than the same tiresome, stupid nagging and urging. Such bosses are always complaining of the wretched character of their men, and of the hard time they have in getting any good work done. Perhaps the reason is, that all the good men quit such a shop, and the "boss" has to put up with poor fellows who can't get a job anywhere else. Good men "don't have to" stay in such a place, and they won't.

Sometimes I have employed a man who had been discharged by one of these mule-drivers, who declared that he was "no good." But as that was his opinion of nearly everybody, I thought I would give the man a trial. As a result, I obtained a useful hand. And since I could use the man, and the other fellow couldn't, I concluded that I could handle men better than he could.

Form your own judgment of the character of every one of your men. Don't let any reports about him, or any one else's opinion, settle this matter for you. You must learn what hundreds of employers have never learned—to know a good man when you've got him. And then, if he isn't worth as much to you as he is to anybody else, either you or your business must need looking after. UNCLE BEN.



CULTIVATION OF INVENTIVE CAPACITY.

Typewriters in some of the down town offices are learning a trick of trade that promises to fill many a spare moment with profit. The typewriting business is a variable one. There are many hours in it that are wholly idle, when time hangs. On busy days, on the other hand, callers are frequently turned away, so great is the rush of business. It happens in the majority of cases that men are not in so much of a hurry for typewritten copy as they are to dictate what they have in mind and be rid of it. They can wait a few hours, or a day or more, for the copy, when once it is practically disposed of by dictation. Herein lies the office of the phonograph. A caller, finding the typewriter occupied, can step into a corner and talk at a phonograph what he wants to say. The operator takes out the sheet, and lays it away for a leisure moment. When that moment arrives, the phonograph repeats the dictation at a speed easily regulated. The device saves time to the one dictating, for the phonograph will take speech as fast as it can be uttered. It serves, also, to give the typewriters occupation in hours that would be otherwise idle, and no business need now be turned away. Those who are employing the device find that it works very well.—*New York Times.*

One of the regular old-fashioned "hold-ups" was recently made in the instance of a railroad train on the Missouri Pacific. The train stopped at a station, and while one man covered the engineer with a rifle, three others went through the mail car, getting, it is said, considerable booty.

Machinists' Supplies and Iron.

NEW YORK, November 7, 1891.

Iron—American Pig—The market still remains quiet, and prices are somewhat unsettled.

We quote: Standard Northern brands, No. 1 Foundry, at $16 to $17; No. 2 is selling at $15 to $16.50, and Grey Forge at $13.75 to $14.50. Southern brands of good quality are obtainable at $16 to $17.50 for No. 1 Foundry; $15.75 to $16 for No. 2; and $14 to $14.50 for No. 3.

Scotch Pig—We quote Coltness at $23, and Eglington at $20.50.

Antimony—The demand has improved, and may now be said to be good. Prices are firmly maintained.

We quote Hallett's, 11¾c; Cookson's, 14c; L. X., 12½c.

Copper—Trade continues very dull, but prices have ruled steady during the week. Values for Lake are at 11.65c. to 11.70c.; Casting Copper, 11¾c. to 11½c.; and Arizona Ingot at 12c. to 12¼c.

Lead—Buyers are holding off in expectation of a decline in prices, and present quotations are nominal at 4.15c. to 4.20c.

Lard Oil—The market is weak, and prices are 53c. to 54c. for Prime City; Western is quoted at 52c.

Tin—Prices are nominal, and there is very little going on. Quotations are 19.90c. to 19.95c.

✲WANTED✲

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Wanted—Machts in every shop to sell the best surface gauge; big profits. E. G. Smith, Columbia, Pa.

Wanted—Posi'n as eng'r, exp'd with ice machines, pumping and stationary eng. L. A., AM. MACHINIST.

Pattern maker exp'd in general pattern making, special mach'y, etc., desires sit. BOX 99, AM. MACH.

Draftsman of experience and education desires to change. N. Y. or Brooklyn. Sheff, AM. MACH.

Wanted—An engineer and machinist to set up engines; state experience, and wages expected. C. H. Brown & Co., Fitchburg, Mass.

Wanted—A draftsman and designer; one familiar with mining and ore-washing machinery preferred. Address South, AMERICAN MACHINIST.

Wanted—A superintendent for brass works making engine and boiler fittings a specialty. One able to construct special tools pref'd. H. K., AM. MACH.

Wanted—A foreman for iron foundry, general machinery; $1,200. Address, stating experience and reference, Vulcan Iron Works, Chicago.

Wanted—Situation as foreman, first-class on engine work; experience with indicator. Address A. D., care of AMERICAN MACHINIST.

Wanted—Situation as superintendent or foreman of boiler shop by a practical boiler maker; 1st-class references. Boiler Maker, AMERICAN MACHINIST.

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Young Swede (technical graduate and practical machinist) wants situation as draftsman; has 3½ years' shop and drawing room experience in U. S. Address Box 95, AMERICAN MACHINIST.

Wanted—Position by exp'd draftsman and designer, well up in water-work mach'y, pumps and locomotive work; college graduate, and used to calculate; 31 years old. Address E., AM. MACH.

A first-class mechanical draftsman desires position; thorough in engine and general machine designing, competent to take charge, excellent references. Address Box 100, AMERICAN MACHINIST.

Wanted—Salesman to sell machine tools—must be well posted—for New York city and vicinity; a hustler and good man; good salary and permanent engagement guaranteed; all communications strictly confidential. Hustler, care AM. MACHINIST.

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Young mech. eng. with ext. exp. in shop management, who is a thorough and progressive mechanic, conversant with modern methods, desires to correspond with parties needing an efficient man as supt. of works. Machine tools or other first class work preferred. Box 98, AM MACHINIST.

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Wanted—A position by a machine and structural iron work draftsman, experienced at estimating, contracting, designing, laying out and superintending work and workmen, himself a thorough mechanic, and also experienced as bookkeeper and business manager; 37 years of age, strictly temperate, and of good moral character. Address "Philada," care AMERICAN MACHINIST.

✣ MISCELLANEOUS WANTS ✣

Advertisements will be inserted under this head at 35 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Cheap 2d hd-lathes & planers. S. M. York, Clev'd, O.

Auto. Steam Flue Cleaners. Kelley Co., Erie, Pa.

Light and fine machinery to order; Foot Lathe Catalogue for stamp. E. O. Chase, Newark, N. J.

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Wanted—Specialties to build for the Southern trade. Bluefield Iron Works, Bluefield, W. Va.

Corliss engs. and gen. mach'y designed, working drawings made. A. W. Jacobi, 136 Liberty St., N. Y.

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Special leather and cement for covering pulleys; no rivets required; local agents wanted. Crescent Mfg. Company, Cleveland, Ohio.

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Wanted—Engineers to write for catalogue of all the latest and most valuable mechanical, scientific and electrical books which are given free with each barrel of the Pittsburgh Boiler Scale Resolvent. Pittsburgh Boiler Scale Resolvent Co., Pittsb'gh, Pa.

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Wanted—A foundryman, way up on fine work, with some capital to put in a foundry in connection with a factory in the South—an unusual opportunity. Address Winslow, 1542 North Wolf Street, Baltimore, Md.

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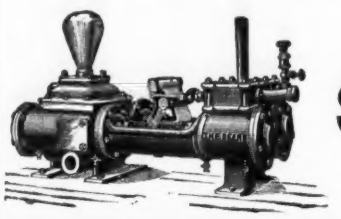

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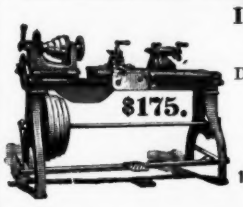

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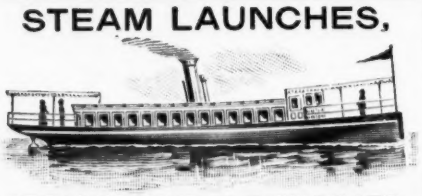

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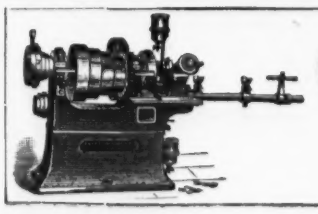

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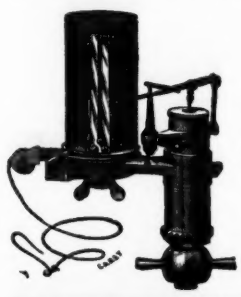

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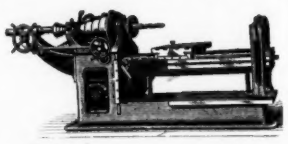

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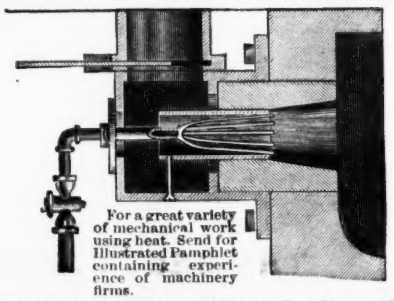

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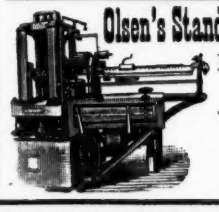

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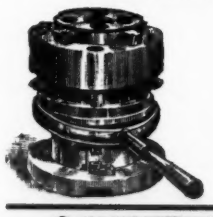

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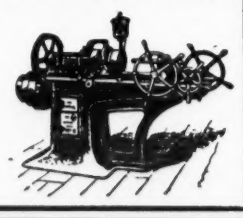

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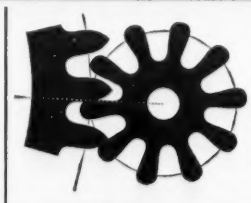

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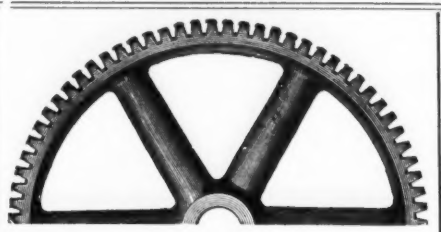

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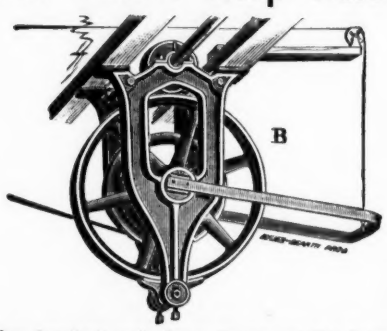

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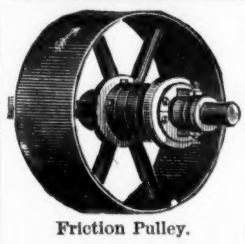

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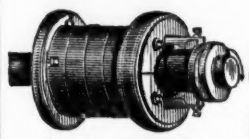

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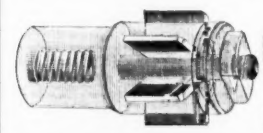

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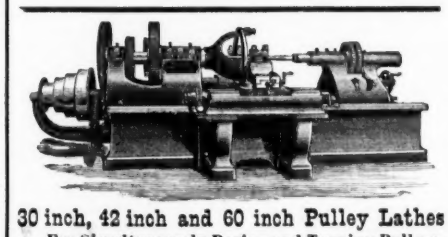

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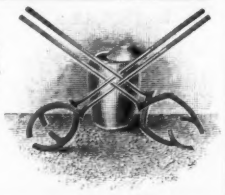

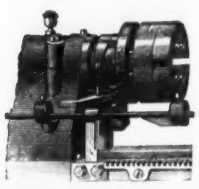

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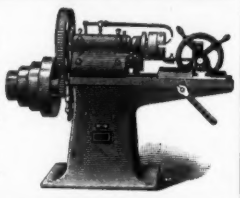

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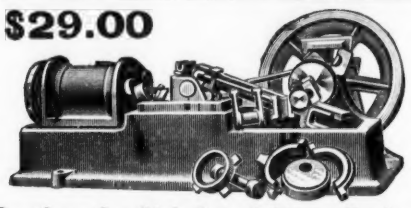

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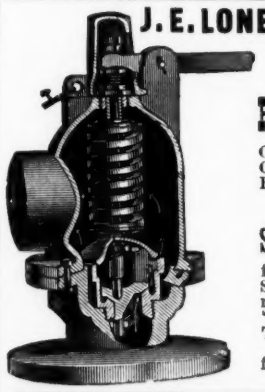

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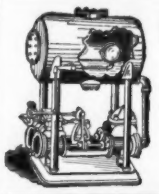

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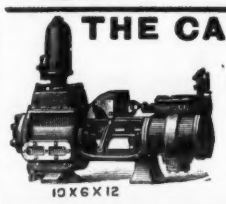

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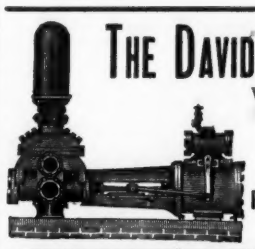

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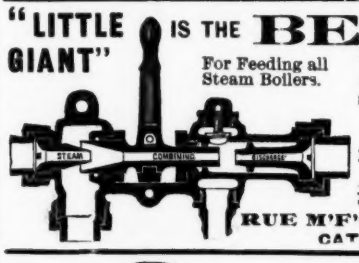

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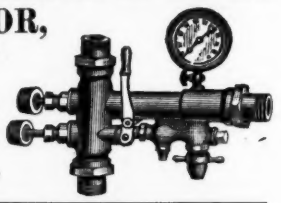

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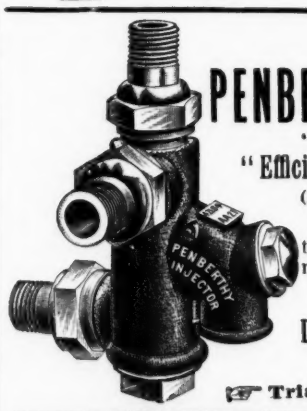

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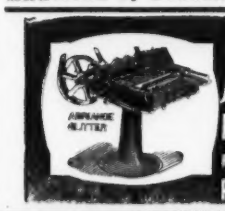

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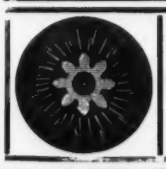

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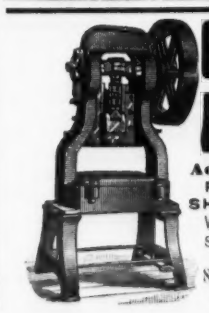

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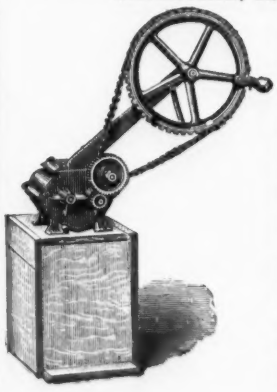

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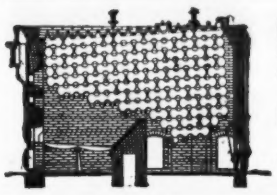

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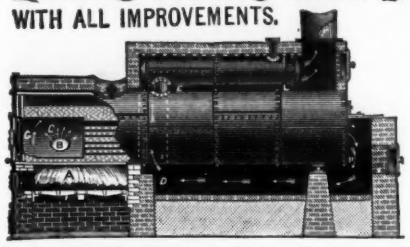

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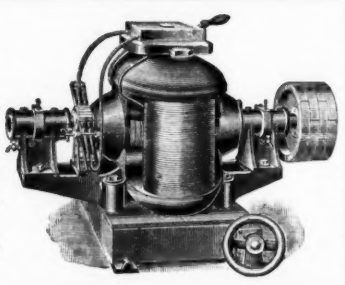

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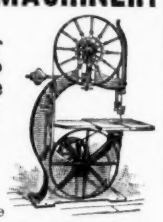

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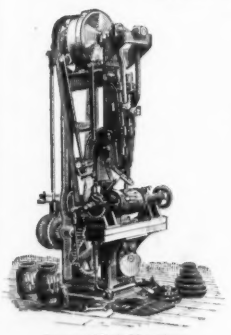

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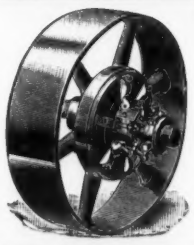

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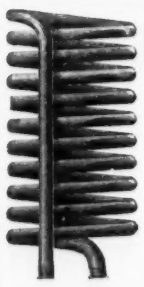

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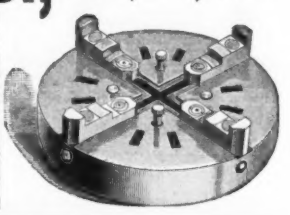

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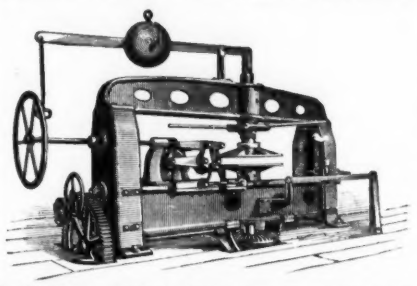

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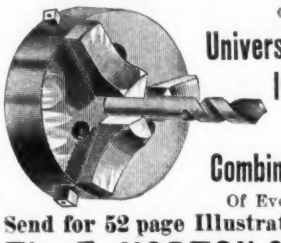

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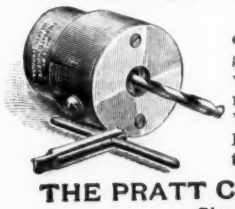

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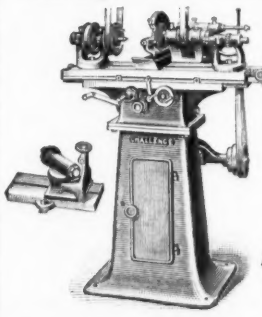

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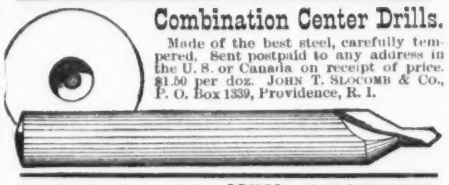

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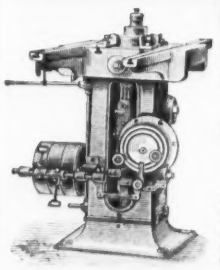

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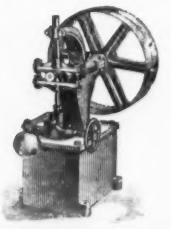

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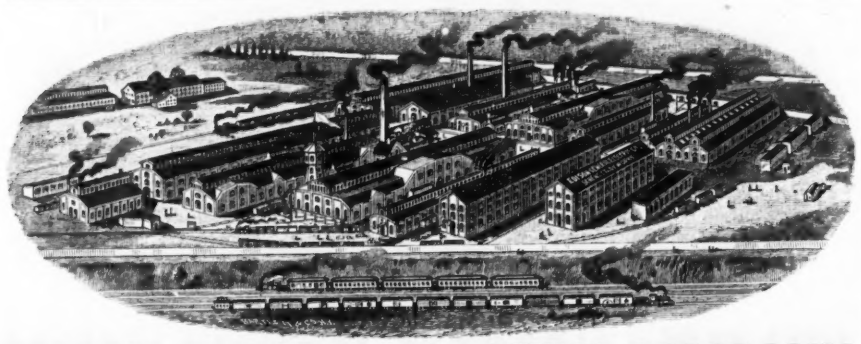

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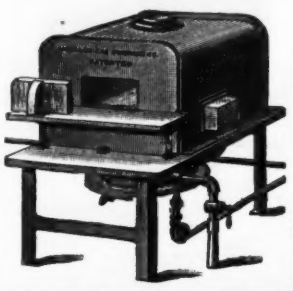

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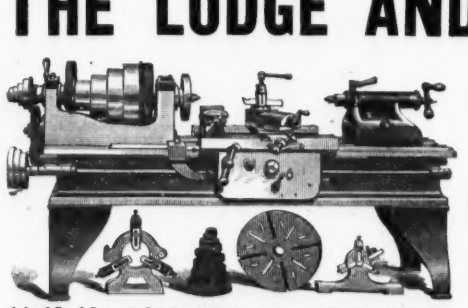

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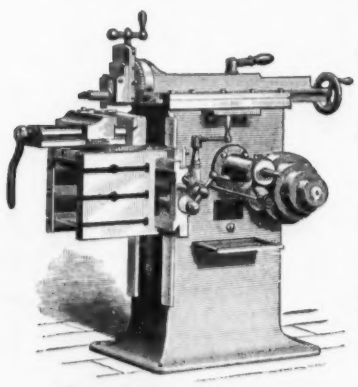

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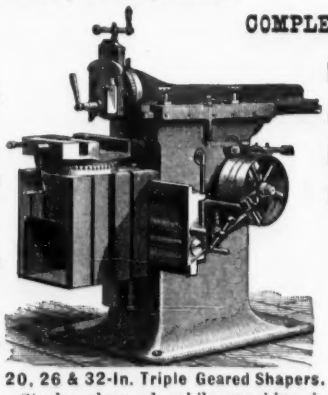

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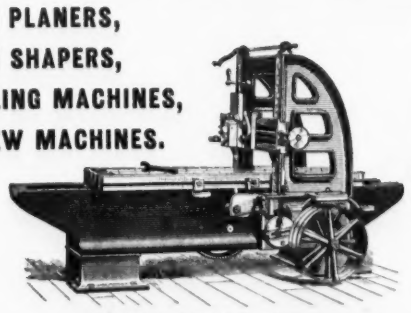

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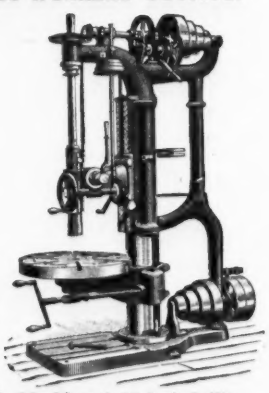

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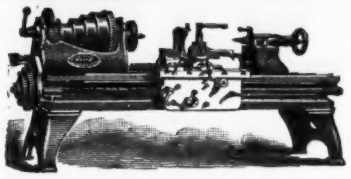

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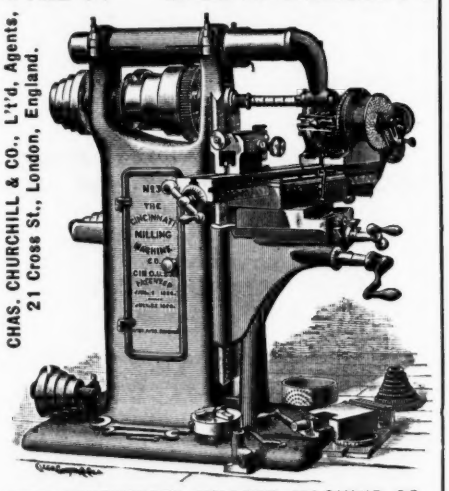

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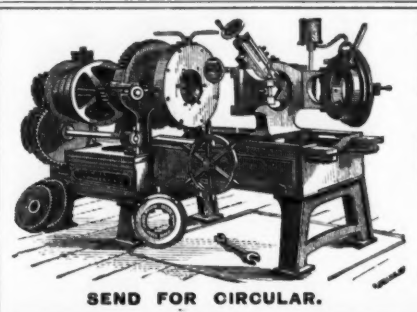

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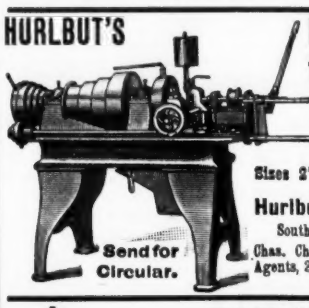

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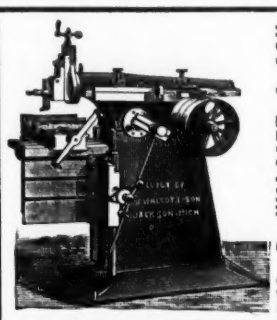

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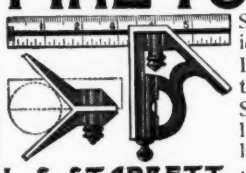

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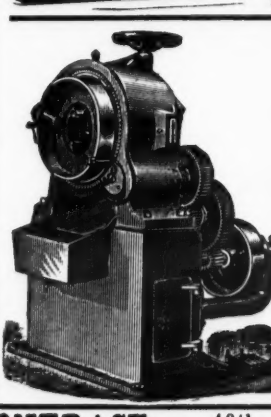

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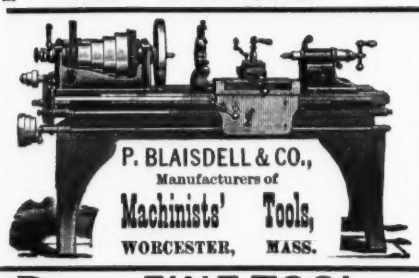

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RATCHET DRILLS, RATCHET DIE STOCKS AND MALLEABLE IRON PIPE VISES.

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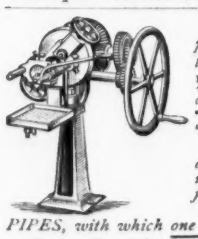

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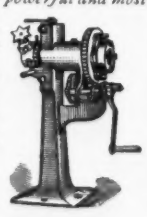

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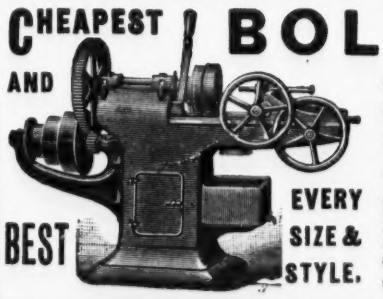

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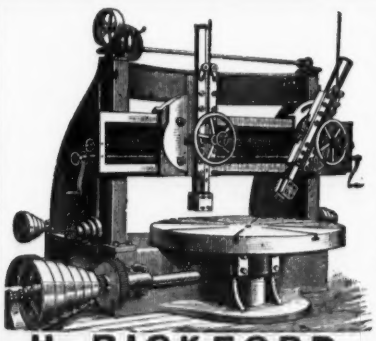

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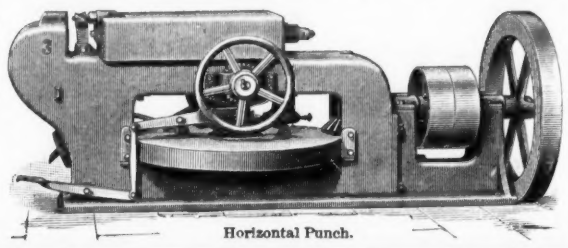
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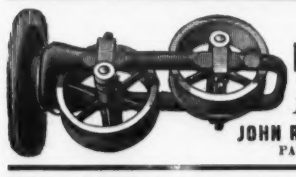
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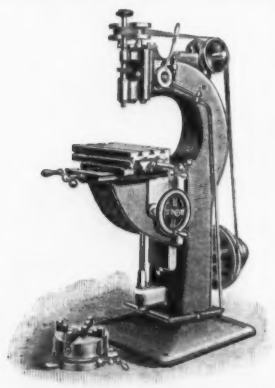
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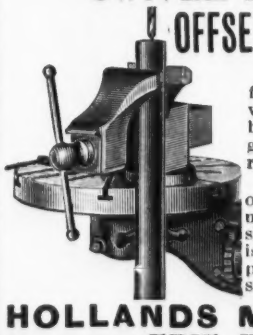
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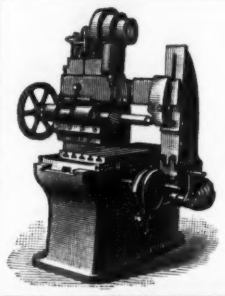
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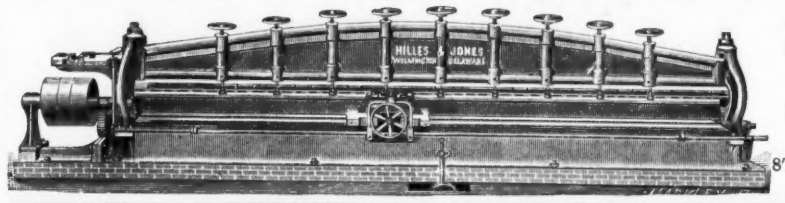

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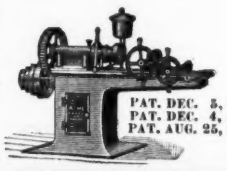
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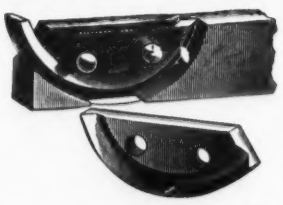
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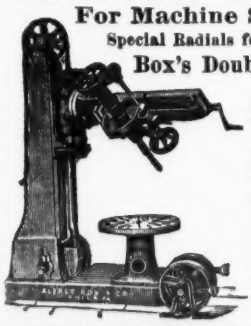
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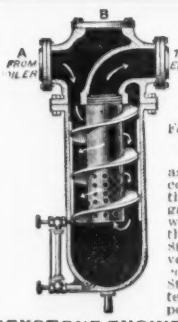

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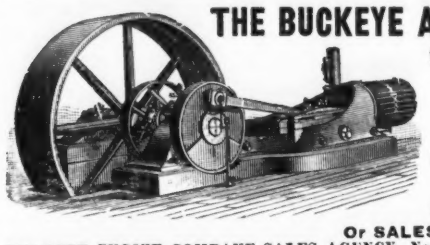

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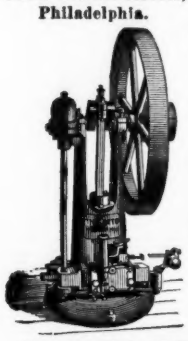

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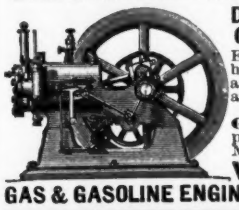

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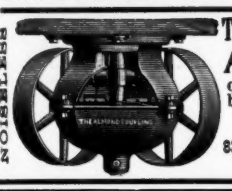

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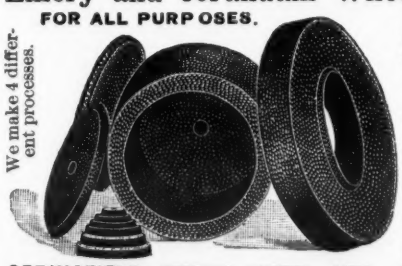

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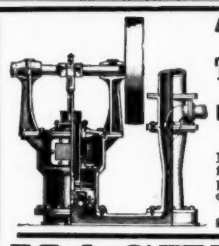

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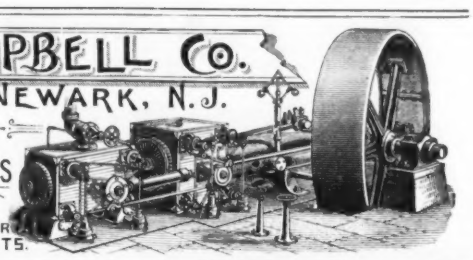

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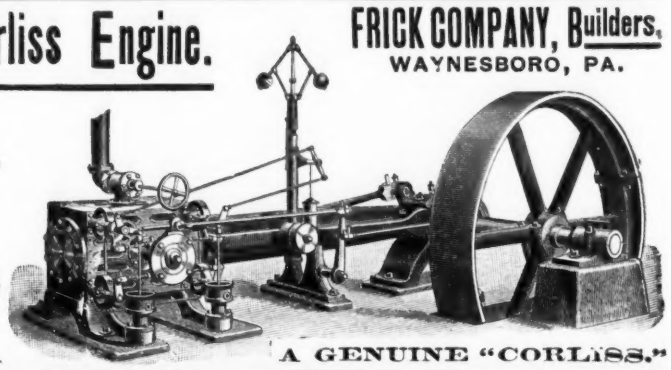

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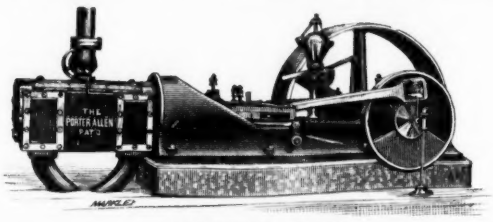

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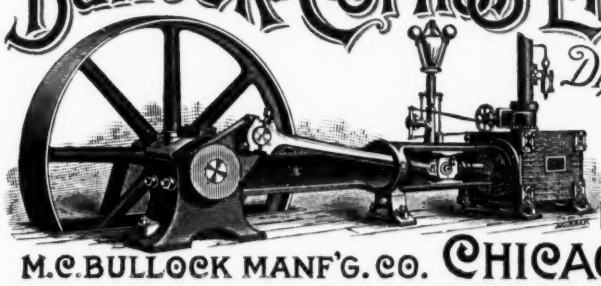

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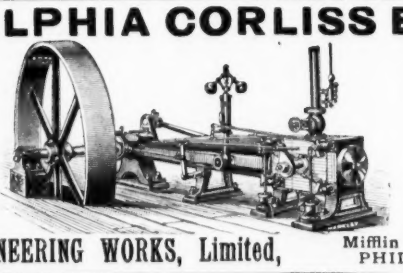

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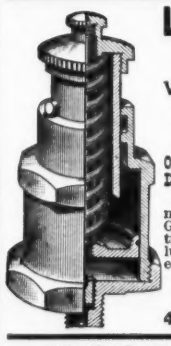

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One 36 inch " " " J. E. Snyder, new.
One Horizontal Engine, 10 inch Cylinder, 14 inch stroke.
One 15 Horse-Power Upright Boiler.
One 16 inch Pillar Shaper.

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USE THE NOISELESS PATENT.
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RAW HIDE GEAR
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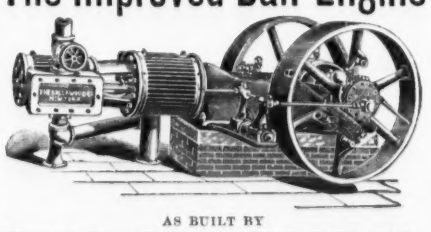

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Office, 15 Cortlandt St., New York,

Is superior in DESIGN, FINISH and WORKMANSHIP. In REGULATION and ECONOMY it has no equal. Built with new tools, from new patterns and after long experience, it should and DOES mark the latest step in steam engineering.

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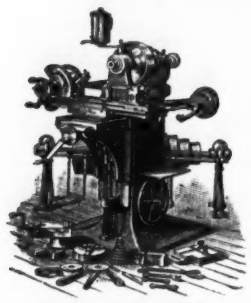

The prices of a number of our machines have been reduced in conformity with our custom of charging less for our work when the cost of production has been reduced, and we are confident we are in a position to adequately meet the demand which usually follows a reduction in prices.

For a number of months these particular changes were contemplated and desired, but our stock continued small, although we endeavored to enlarge it, and were constantly extending our buildings, adding to our machinery, and increasing the number of our workmen. A few weeks ago, however, the success of our efforts became apparent, and we take pleasure in announcing the reduction in prices and stating that we are in position to satisfactorily serve our customers.

BROWN & SHARPE MFG. CO.,

PROVIDENCE, R. I.

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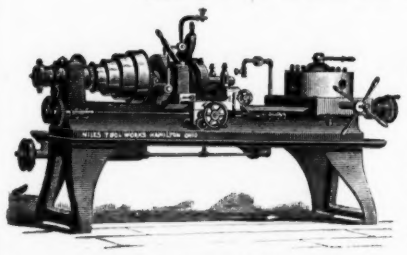
MACHINE TOOLS.

SCREW MACHINES.



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For making all kinds of Set Screws, Tap Screws and Studs. Will do the work of three or four small lathes and turn it out in better shape. Send for special catalogue fully describing machines and illustrating samples of work done.

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"Here is a valve just as good as the Genuine Jenkins Bros. and costs you less money." This is the war cry of the imitators and their friends. In answer to this cry we will drag out our old hundred ton gun—which never fails to clear the field—and here is the SHOT.

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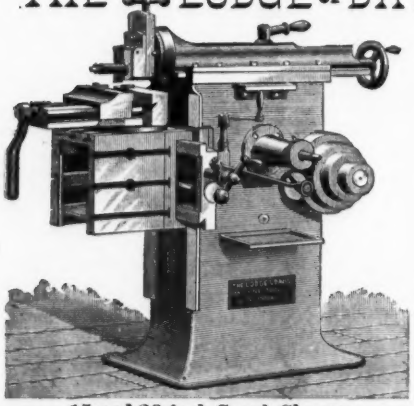
If you will put a Jenkins Bros. Valve on the WORST PLACE YOU CAN FIND, where you cannot keep other valves tight, and if it is not Perfectly Tight or does not hold Steam, Oils, Acids, Water or Other Fluids Longer Than Any Other Valve, you may return it and your money will be refunded. **JENKINS BROS., New York, Philadelphia, Boston & Chicago.**

THE LODGE & DAVIS MACHINE TOOL CO.

Works: CINCINNATI, OHIO.



15 and 20-inch Crank Shapers.

BUILDERS OF

IRON, STEEL, AND BRASS WORKING MACHINERY.

20, 26, and 32 inch GEARED SHAPERS.

Write for large cuts with full descriptions.

MACHINE SHOP OUTFITS.

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BOSTON OFFICE, 23 and 25 Purchase Street, Boston, Mass.
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SOLE AGENT FOR GREAT BRITAIN,
ALFRED HERBERT, Coventry, England.

☞ See Advertisement on Page 16.

NOTICE!!

Who are making the original improvements in this important tool?

REDUCED price on our No. 1 Universal Milling Machine with Overhanging Arm and all latest improvements.

No. 1 Universal Miller with Overhanging Arm.

$480.00/100 NET, DELIVERED

At any Railroad Depot East of the Mississippi. Machine fully guaranteed.

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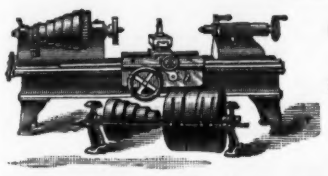

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AND OF THE FOLLOWING KINDS:

Hand, Engine for Turning and Screw Cutting, Cutting Off, Gap Bed, Pulley Turning and Boring, Turret-Head Engine and Chucking, Hand Wheel Rim Turning, Spinning, Grinding, Pattern Making, &c.

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IN 12 SIZES 3/8 UP TO AND INCLUDING 4 IN. ALSO CLAMP AND DIE DOGS

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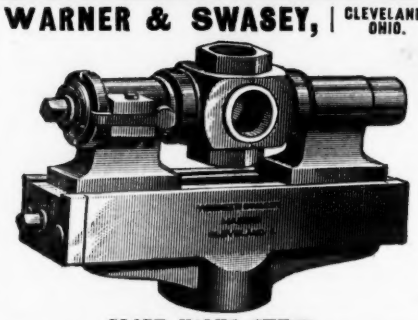

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BRASS WORKING MACHINERY.

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Manufacturer of ENGINE LATHES from 16 to 48 in. swing. Cuts, Photographs and Prices furnished on application.
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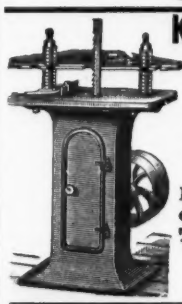

Key-Seating Machines and 20 in. Drills

A SPECIALTY.

SEND FOR LIST OF

New and Second-Hand

Lathes, Planers, Drills, or anything in Machinists' Tools or Supplies.

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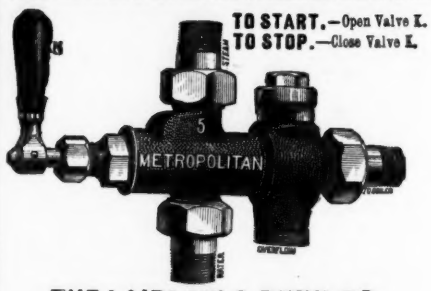

TO START.—Open Valve L.
TO STOP.—Close Valve L.

THE LAIDLAW & DUNN CO.

CINCINNATI, O., 1, 4, '91.

The Hayden & Derby Mfg. Co.,
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GENTLEMEN:—In response to yours of the 2nd, we desire to say that we have sold a number of your Metropolitan Automatic Injectors, with pumping plants manufactured by us, and in all cases they have given the very best of satisfaction. They are simple in construction and very reliable.

Yours respectfully,
ROBERT LAIDLAW, Pres.

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GRANT'S GEAR WHEELS and GEAR CUTTING of every kind and all sizes, ready made or made to order New Treatise on Gears for $1.50. Send for Catalogue or Estimate

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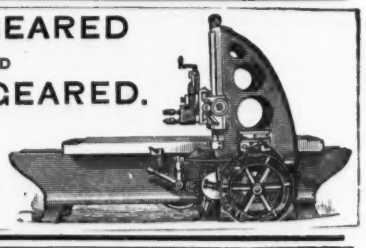
SPUR GEARED AND SPIRAL GEARED.



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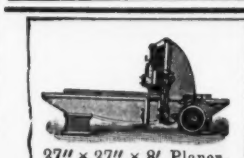
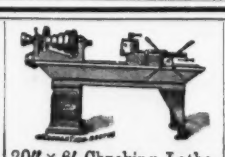
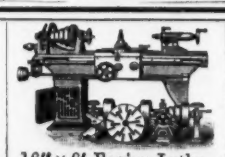


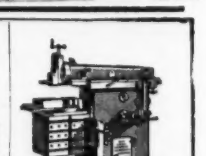
27" × 27" × 8' Planer.



20" × 6' Chucking Lathe.



16" × 6' Engine Lathe.



25" Pillar Shaper.

THE HENDEY MACHINE CO. TORRINGTON, CONN.
MANUFACTURERS OF MACHINE TOOLS. SEND FOR OUR CATALOGUE.

Manufacturer —of— TAPS & DIES

4 inches face, and the worm has a single thread.

The longitudinal traverse gear consists of a set of miter wheels and clutches on the crank-shaft, like those for the cross traverse, giving motion to a horizontal shaft, which drives another parallel horizontal shaft by two pairs of spur wheels for change of speed, having eighteen and eighteen teeth and twelve and twenty-four teeth respectively, 2 inches pitch, 4 inches face. This second shaft drives a horizontal cross-shaft by a pair of bevel wheels, having twenty and twenty-six teeth, 2¼ inches pitch, 4 inches face. This latter shaft drives a vertical shaft on one side of the crab, and through it a horizontal square shaft, resting in tumbler bearings on the traveler girders, by means of two pairs of bevel wheels like the last, having twenty and twenty-six teeth. At each end this square shaft drives a vertical shaft on the end carriage by a pair of bevel wheels having twelve and thirty-six teeth, 2¼ inches pitch, 4 inches face. Each vertical shaft drives a horizontal shalft, crossing the ends of four wheel axles at the height of their center line, by a pair of bevel wheels having twelve and twenty-four teeth, 2¼ inches pitch, 5 inches face. This horizontal shaft drives four running wheels by bevel wheels having twelve and thirty-six teeth, 2½ inches pitch, 4 inches face, the 36-tooth wheels being keyed onto the axles of the running wheels. Thus four wheels in each end carriage are geared for the longitudinal traverse.

The crab sides are made of ½-inch steel plates, framed together with 3-inch by 3-inch by ½-inch angle steels, and stiffened where necessary, and firmly framed together crosswise. Each side frame rests on five double-flanged cast-steel running wheels, 2 feet 6 inches diameter on the tread, forced or keyed onto their axles. The two wheels at the heavy end of the crab on each side are fixed on axles common to both sides, so as to have four wheels geared up for the traverse. All the other wheels have short axles. Each wheel has a bearing on each side for the axle to run in. These bearings consist of a top brass in a cast-iron axle-box, with a lubricating sponge-box kept up to the bearing with a key underneath.

A platform is formed round the crab, and the whole surmounted with a house, framed with angle-iron and covered with corrugated sheets, as shown. The platform is strong enough to carry the boiler on one side, with a coal-bunker in the corner, and the feed-water tank on the opposite side.

The boiler is of the cylindrical horizontal marine return-tube type, 5 feet 6 inches diameter, 9 feet 6 inches long, all steel, except the tubes, which are wrought-iron. The shell is $\frac{5}{16}$ inch thick, with double-riveted lap joints for longitudinal seams, elsewhere single-riveted; ends ½ inch thick, each in one plate; flue, 2 feet 9 inches diameter, $\frac{7}{16}$ inch thick; fire-box, ½ inch thick; 116 tubes 2 inches diameter by 8 feet long. The fire-box and ends are efficiently stayed with screw and gusset stays in the usual manner, suitable for 100 pounds working pressure, although the ordinary working pressure is to be only 80 pounds. The total heating surface is 560 square feet. A sheet-iron smoke-box with a hinged door, surmounted by a short chimney, is fitted to the front end of the boiler, as shown. The boiler is fitted with all the usual mountings, including feed donkey pump, and lagged with Leroy's non conducting composition. A coal-box is fitted near the front of the boiler to contain one ton of coals, or sufficient for twenty-four hours' consumption in ordinary work. A feed-water tank is placed on the platform on the opposite side of the crab to the boiler, to contain 65 cubic feet of water, or sufficient for six hours' ordinary work. The main girders are of the box section, made of steel plates and angles 7 feet 6 inches deep by 2 feet 5 inches broad over flanges; the top is level, and the underside fish bellied, the ends which rest on the end carriages being 2 feet 8 inches deep. Each of the flanges is made of two plates ½ inch thick, extending about 20 feet either side of the center, beyond that of one plate only, and two angles 4½ inches by 4½ inches by ⅝ inch; the webs are $\frac{7}{16}$ inch thick, butt-jointed, the joints being covered by flat bars 6 inches by ½ inch on outside, and 6 inch by 3-inch T-steels inside, each T-steel flange, and $\frac{7}{16}$-inch webs and 6 inch by 3-inch by ½-inch T stiffeners. The lower girder consists of two separate girders connected together at ends and between the wheels, each made of ⅝-inch web plate, and two angles 3 inches by 3 inches by ⅝ inch top and bottom.

The wheels are of cast-steel, double flanged, and 2 feet 6 inches diameter on the tread. Each is forced on to a short steel axle running in an axle-box bearing on either side, similar to those of the crab. Four of the axles in each end carriage are lengthened to carry the bevel wheels already described in the longitudinal traverse gear. The wheel base of each end carriage is about 21 feet, and the length of the carriage over all about 24 feet.

The speeds provided are as follows: Hoisting, 2 feet per minute for 150 tons, and 4 feet and 6 feet per minute for lighter loads. Cross traverse, 15 feet per minute. Longitudinal traverse, 15 feet per minute for full load, and 30 feet per minute for lighter loads.

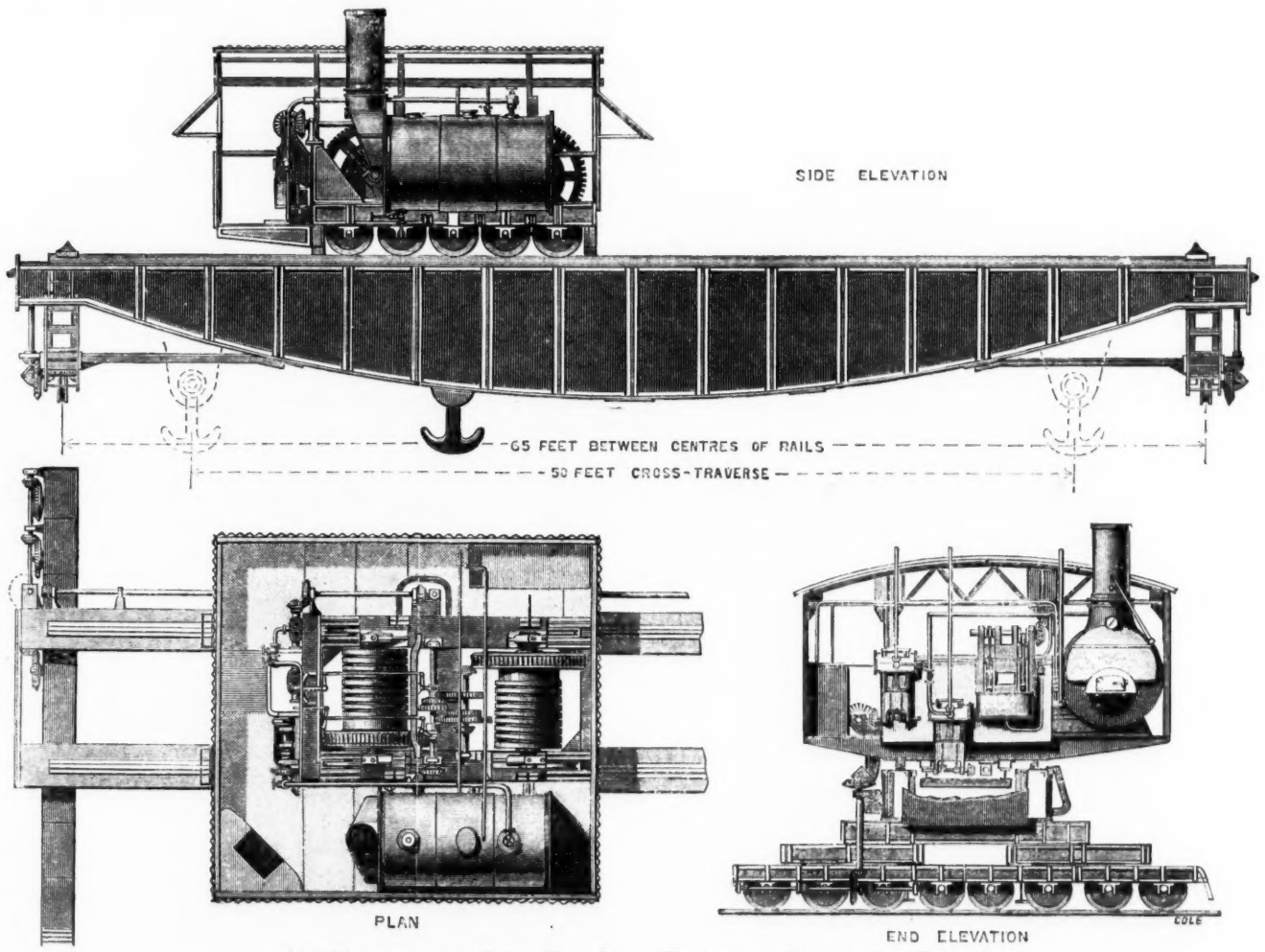
The maximum range of lift is from 3 feet to 24 feet from the ground to the bottom of the hook, with the top of the gantry rails 26 feet above ground, giving a lift of 21 feet. The maximum cross traverse is 54 feet.

Generally the bearings have all brass linings, and suitable lubrication is provided throughout. Ladders are fitted where necessary, to give access to the several parts of the traveler. All rivet holes are drilled. All gearing and running wheels are of cast-steel, and shafts of forged steel.

TESTS.

The plates and bars are of mild steel, with a tensile strength of not less than twenty-eight tons per square inch, an elongation of not less than 20 per cent., and a contraction of area of 40 per cent. The boiler was tested to 150 pounds per square inch by hydraulic pressure.

We are indebted for the illustrations and description to our esteemed contemporary, *The Engineer*, London.



ONE HUNDRED AND FIFTY TON STEAM TRAVELING CRANE.—SEE PAGE 4.

The September statement of the Central Railroad of New Jersey shows net earnings of $529,030—a decrease of $25,743 from the corresponding month of last year. The net earnings from January 1 to September 30 were $4,387,744—an increase of $231,534 over the same time last year.

LETTERS FROM PRACTICAL MEN.

Piece-work.

Editor American Machinist:

I have been very much interested in the articles and discussions that have lately appeared in your paper for and against piece-work. I must confess I fail to understand how any one can claim that by day-work he can produce better work, or compete with their more enterprising neighbors who have adopted piece-work.

In your issue of Sept. 3d, Mr. Cairns takes the ground that piece-work is unfair to the good workman. He takes foundry work to prove his statements. Now, any one that knows anything about molding or foundry work knows that there can be nothing more unfair to a good molder than to have a fixed price per day for each man, the good and the poor alike. This may not be the case in some foundries, but I know some proprietors tell their foremen the amount of pay their men must receive, taking it for granted that one man ought to be as good as another, and capable of doing any job that comes into the shop.

In your issue of Aug. 6th Mr. Wathey makes a good point when he says that piece-work will bring out the best qualities of the men; this is certainly true, for it gives the good workman what he is worth; it gives to the ambitious and those that are not afraid of doing too much work a chance to be something more than common workmen. To the poor workman it does no injustice; he receives pay for what he does, and has no cause to complain.

Mr. Cairns takes up this point and tries to prove it is just the reverse; that the poor workman gets the best of it. One illustration he gives is, that a first-class molder gets a steam cylinder to make. It is a fair day's work, and he gets $3 for it. A poor hand gets grate bars to make; he gets 30 cents a flask with two patterns in it; he makes ten flasks a day, and gets his $3. He then goes on to say that there is ten times more labor in making ten flasks of grate bars than in making the cylinder, and ten times more skill in making the cylinder than in making the grate bars. I see no injustice in this. The good molder has the best of it. The objection of Mr. Cairns is, the poor molder, by working hard, receives as much pay as the good workman does who takes his time, and manages to get in a full day on the cylinder. I suppose if the poor workman had worked all day and made five flasks of grate bars, and received $1.50 for it, he would think that it was right.

He then takes stove plate work. I would enjoy seeing Mr. Cairns run a stove plate shop on day-work. I think he would have a hard time to sell his stoves at a profit. It would double the price of stoves, and not give so good a stove. There is nothing will make a man so careful as to take his lost work out of his own pocket. It will make him more thoughtful, and in looking after his own interest it helps his employers. How many times I have seen a molder lose everything he made for two or three days, and if on pay day there should be a mistake in his pay, how quick he would speak of it,